부록. 표 1 해석 타입(Study Types)

Study	설명
Stationary Studies	
Stationary	정상상태 해석. 모든 시간 도함수는 무시. 정적 PDE 문제를 지닌 최적화 문제에도 적용가능.
Time-Dependent Studies	
Time Dependent	매 시간마다 계산을 하는 시간 의존 또는 과도해석. 시변 PDE 문제의 최적화에서도 사용.
Time Discrete	시간 해석 시, 이산화 과정을 다룬 문제를 풀고자 할 때 사용함. prev( )나 bdf( ) 함수를 사용할 수 있음.
Frequency to Time FFT	Time Dependent 해석에서 주파수 영역을 시간 영역으로 변경하는 FFT 수행.
Eigenfrequency Studies	
Eigenfrequency	고유진동수 계산.
Eigenvalue	고유치 계산.
Stationary Then Eigenfrequency	Eigenvalue 솔버를 사용하기 전에, 최적화에 대해 Stationary 솔버를 사용.
Frequency Domain Studies	
Frequency Domain	주파수 영역 해석.
Frequency-Domain Perturbation	바이어스 솔루션에 대한 작은 진동 연구.
Time to Frequency FFT	Frequency Domain 해석에서 시간영역을 주파수영역으로 변경하는 FFT 수행.
해석 확장	
Batch	Show More Options > Batch (또는 Batch and Cluster) 체크 시 사용 가능. 지정된 해석을 기반으로 batch 해석 수행.
Batch Sweep	Show More Options > Batch (또는 Batch and Cluster) 체크 시 사용 가능. 관심 매개변수별로 지정된 해석을 통해 batch 해석을 수행.
Cluster Computing	Show More Options > Batch and Cluster 체크 시 사용 가능. Job scheduler를 통해 해석.
Cluster Sweep	Show More Options > Batch and Cluster 체크 시 사용 가능. 관심 매개변수별로 지정된 해석을 job scheduler를 통해 해석.
Combine Solutions	두 개의 솔루션을 결합.
Function Sweep	Definitions > Functions > Function Switch에서 정의한 함수 변화에 따른 해석 수행.

Study	설명
Material Sweep	Materials > More Materials > Material Switch에서 정의한 물성 변화에 따른 해석 수행.
Model Reduction	Time Dependent 또는 Frequency Domain 해석에서 감소 차수 모델 생성
Multigrid Level	Show More Options > Multigrid Level 적용 때 보임. Geometric multigrid로 해석 진행.
Parametric Sweep	관심 매개변수의 변화에 따른 해석 수행.
Sensitivity	민감도 해석.
Study Reference	다른 study를 이번 단계에서 참조.
Surrogate Model Training	Surrogate Model 생성을 위해 Surrogate Model Training 노드 추가.

Study (분야별 지원)	설명
Chemical Applications	
AC Impedance, Initial Values	전기화학 전지에서의 전기화학적 임피던스 분광법(EIS) 계산.
AC Impedance, Stationary	두 개의 계산 단계가 만들어짐. 1단계는 정상상태(Stationary) 해석, 2단계는 주파수 영역에서의 조화섭동(harmonic perturbation) 해석.
AC Impedance, Time Dependent	두 개의 계산 단계가 만들어짐. 1단계는 시변(Time Dependent) 해석, 2단계는 주파수 영역에서의 조화섭동(harmonic perturbation) 해석.
Cyclic Voltammetry (under Time Dependent)	전압전류법(voltammetry) 실험의 시간 해석을 수행하기 위한 Electroanalysis 인터페이스에서 지원하는 해석.
Stationary Plug Flow (under Stationary)	Chemical Reaction Engineering 모듈이 있는 Reaction Engineering 인터페이스에서 사용. 반응기 부피에 따른 몰유량을 계산.
Time-Dependent with Initialization	전기화학에서의 시간 해석 수행. 전역 ODE 종속변수(변형과 관련됨), 전해질/전극 전위 해석. 실제로 해석이 되는 변수에서 변형과 관련된 ALE(X, Y, Z)를 포함. 예를 들어, 메시 변형이 가시적으로 해석 구조체에서 변하는 전기화학 시간 해석에 유용함. Current Distribution Initialization 다음 Time-Dependent로 구성됨.
Time Dependent, Fixed Geometry	실제로 해석이 되는 변수에서 변형과 관련된 ALE(X, Y, Z)를 제외. 예를 들어, 메시 변형이 작은 전기화학 시간 해석에 유용함. Current Distribution Initialization 다음 Time-Dependent, Fixed Geometry로 구성됨.
Electrical and Optical Applications	

Study (분야별 지원)	설명
Bidirectionally Coupled Particle Tracing	입자 또는 광선 궤도와 고정된 필드의 상호 작용 모델링.
Bidirectionally Coupled Ray Tracing	외부 필드의 영향을 받는 광선 궤적을 계산.
Boundary Mode Analysis	전체 형상에 대해 주파수 영역 해석과 포트(경계)에서의 모드 해석이 결합.
Coil Geometry Analysis	전도성 와이어 다발에 의해 생성되는 전류 밀도를 주는 Multi-Turn Coil Domain 노드에서 전류 흐름에 대한 고유 값 문제를 해결.
Time to Frequency Losses	Loss Calculation 하위 노드의 손실을 계산하는 데 사용되고, 일반적으로 시변 해석 다음으로 추가되는데, 시변 해석을 계산하기 전에 Loss Calculation 하위 노드가 추가
Frequency-Stationary	Induction Heating과 Microwave Heating 인터페이스에서 적용되며, Stationary에서의 설정과 동일함.
Frequency-Transient	Induction Heating, Microwave Heating, Inductively Coupled Plasma, Microwave Plasma 인터페이스에서 적용할 수 있으며, Time-Dependent에서의 설정과 동일. 가령, 주파수 영역에서 전자기파를 해석하고, 시간 영역에서 온도(또는 전자 온도)를 해석.
Mean Energies (under Frequency Domain)	Plasma 모듈의 Boltzmann Equation, Two-Term Approximation 인터페이스에서 사용 가능. 평균 전자 에너지의 값 배열 기입에 적용. Frequency Domain에서 해석.
Ray Tracing	광궤적 해석. Time Dependent 해석과 유사.
Reduced Electric Fields (under Frequency Domain)	Plasma 모듈의 Boltzmann Equation, Two-Term Approximation 인터페이스에서 적용.
Schrödinger-Poisson	Schrödinger-Poisson 시스템에 대한 자체 일관된 솔루션으로 사용.
Semiconductor Equilibrium	전하 캐리어가 열 평형 상태에 있는 푸아송의 방정식 해석
Semiconductor Initialization	불순물 도핑 농도 구배를 기반으로 한 조밀한 메시 사용.
Frequency-Stationary, One-Way Electromagnetic Heating	먼저 전자기장에 대한 주파수 도메인 해석 이후 열 전달식에 대해 정상상태 해석을 할 때, 전자기 열원을 소스 항으로 사용. 유도 가열, 마이크로파 가열 또는 레이저 가열 인터페이스와 함께 사용.
Frequency-Transient, One-Way Electromagnetic Heating	순차적으로 전자기장에 대한 주파수 도메인 해석하고, 그 다음에 온도(또는 전자 온도)에 대해 시변 해석. 유도 가열, 마이크로파 가열 또는 레이저 가열 인터페이스와 함께 사용.
Frequency Domain, RF Adaptive Mesh	인쇄 회로 기판 및 RF 응용 분야에 대한 mesh adaptation을 실행하는 주파수 도메인 해석.

Study (분야별 지원)	설명
Frequency Domain Source Sweep	Full S-parameter 매트릭스를 자동으로 추출하여 포트 및 집중 포트(lumped port)와 같은 급전(feeding) 사이를 스위핑하는 주파수 도메인 연구에 사용되고, Frequency Domain 해석 타입과 설정은 유사.
Stationary Source Sweep	정전기학에서 용량 행렬과 같은 일괄 행렬을 추출.
Stationary Source Sweep with Initialization	Magnetic Fields, Currents Only 인터페이스에 대한 사전 설정 해석 단계입. Source Initialization 해석 단계와 Stationary Source Sweep 해석 단계로 구성. Coil Geometry Analysis와 유사.
Frequency Domain Source Sweep with Initialization	자기장, 전류 전용 인덕턴스 행렬과 같은 집중 행렬을 추출하기 위해 사전 설정되어 있고, 소스 초기화와 주파수 도메인 소스 스윕 연구 단계로 구성.
TEM Boundary Mode Analysis	정전위 또는 자기 벡터 전위의 면외 요소를 계산하는 데 사용. 주파수 도메인과 같은 주요 해석 단계를 풀기 전에 거쳐야하는 전처리 단계.
Time Dependent, Modal	모달 해석을 사용하여 시간에 따른 파동 문제를 분석.
EEDF Initialization	EEDF Initialization study는 다른 플라즈마 자유도를 해결하지 않고 전자 에너지 분포 함수 (EEDF)를 계산하는데 사용. 또한 시간 및 공간 의존 플라즈마 모델에 대한 초기 EEDF를 계산하는데 사용.
Time Periodic	모델의 주기적인 정상상태 해석.
Frequency-Time Periodic	주파수 도메인에서 전자기장 분포와 함께 Plasma, Time Periodic 인터페이스를 사용하는 모델을 위해 주기적인 정상상태 솔루션을 계산.
Time Periodic to Time Dependent	시간주기 솔루션을 모델의 시간 종속 솔루션으로 변환.
Wavelength Domain	한개 이상의 파장에 대해 전자기 고조파 여기를 받는 선형 또는 선형화된 모델의 응답 계산.
Fluid Applications	
Frozen Rotor	회전계 상에서의 회전체 내의 유체가 완전발달흐름(Fully Developed Flow)으로 가정. Rotating Machinery, Laminar Flow와 Rotating Machinery, Turbulent Flow 인터페이스에서 적용.
Frozen Rotor with Initialization	회전으로 인한 구조체의 위상이 변하지 않는 회전계에서의 유체 해석. 회전계에서의 시간 해석의 초기 조건으로 사용 가능.
Stationary Free Surface	Free Rotor 또는 Free Rotor with Initialization 연구에 추가되어 자유 표면 변형을 해석.

Study (분야별 지원)	설명
Frozen Rotor with Stationary Free Surface	Stationary Free Surface 후처리 기능이 사용될 때, 회전체에서의 유체를 해석할 때 사용. 두 단계의 해석 타입 적용, 첫 번째는 Frozen Rotor, 두 번째는 Stationary Free Surface 단계.
Frozen Rotor with Initialization and Stationary Free Surface	Stationary Free Surface 후처리 기능이 사용될 때, 회전체에서의 난류 유체를 해석할 때 사용. 세 단계의 해석 타입 적용, 첫 번째는 Wall Distance Initialization, 두 번째는 Frozen Rotor, 마지막으로 Stationary Free Surface 단계.
Stationary with Initialization	초기치 설정이 필요한 정상상태 난류 모델에 사용.
Time dependent with Initialization	초기치 설정이 필요한 정상상태 난류 모델에 사용.
Thermal Perturbation, Eigenfrequency	Eigenfrequency study 단계가 뒤따르는 Stationary study 단계를 사용하여 평형 정상상태 온도장 주변의 진동을 계산.
Thermal Perturbation, Frequency Domain	Frequency-Domain, Perturbation study 단계가 뒤따르는 Stationary 연구 단계를 사용하여 평형 정상상태 온도장 주변의 진동을 계산.
Time dependent with Phase Initialization	시간 종속 이상(two phase)유동 모델에서, level set 또는 phase field 기능이 초기치를 필요로 하는 경우 사용
Stationary, One-Way NITF	2개의 Stationary study 단계 : 유체 유동 변수에 대한 하나의 해석 그리고 열 전달 변수에 대한 하나의 해석. Nonisothermal Flow 및 Conjugate Heat Transfer 인터페이스와 함께 사용할 수 있음
Time Dependent, One-Way NITF	2개의 Time dependent study 단계 : 유체 유동 변수에 대한 하나의 해석 그리고 시간 영역에서의 열전달 변수에 대한 하나의 해석. Nonisothermal Flow 및 Conjugate Heat Transfer 인터페이스와 함께 사용할 수 있음.
Frozen Rotor, One-Way NITF	2개의 Frozen rotor study 단계 : 하나는 유체 흐름 변수를 해석 그리고 다른 하나는 열 전달 변수를 해석. Rotating Machinery, Nonisothermal Flow 인터페이스와 함께 사용 가능.
Stationary, One-Way with Initialization NITF	Wall distance initialization과 2개의 정상상태 연구 단계 : 유체 유동 변수에 대한 하나의 해석 그리고 열 전달 변수에 대한 해석 하나. Nonisothermal Flow 및 Conjugate Heat Transfer 인터페이스와 함께 사용.
Time Dependent, One-Way with Initialization NITF	Wall distance initialization과 2개의 Time dependent study 단계 : 유체 유동 변수를 푸는 하나와 시간 도메인에서 열 전달 변수를 푸는 하나. Nonisothermal Flow 및 Conjugate Heat Transfer 인터페이스와 함께 사용.

Study (분야별 지원)	설명
Frozen Rotor, One-Way with Initialization NITF	2개의 frozen rotor study 단계 : 하나는 유체 흐름 변수를, 다른 하나는 열 전달 변수를 해석. Rotating Machinery, Nonisothermal Flow 인터페이스와 함께 사용 가능.
Stationary, One-Way MF	2개의 study 단계 : 유체 유동 변수에 대한 하나 그리고 연구 및 수분 이송 변수에 대한 하나. Moisture Flow 인터페이스와 함께 사용 가능.
Time Dependent, One-Way MF	2개의 study 단계 : 유체 유동 변수에 대한 하나 그리고 시간 도메인에서의 수분 이송 변수에 대한 하나. Moisture Flow 인터페이스와 함께 사용 가능.
Heat Applications	
Orbit Calculation	시변 해석, 우주선 궤도 모델링에 사용되는 자유도를 해결.
Orbital Temperature	시변 해석, 외부 복사는 여러 궤도 주기에서 재사용.
Orbit Thermal Loads	시변 해석, 외부 복사는 저장되고 우주선 궤도 모델링에 사용되는 자유도를 해결.
Mechanical and Acoustic Applications	
Bolt Pretension	Stationary study 단계의 특수한 경우이며, 전하중 볼트를 모델링하는데 사용되는 특수 자유도를 해결.
Fatigue	피로해석에 적용. 하중 반복을 수행하여 Fatigue 인터페이스에서의 피로 기준을 수행.
Linear Buckling	구조모델에서 고유치솔버를 이용하여 임계 하중 인자를 계산. Stationary 해석 후 Linear Buckling 해석.
Eigenfrequency, Prestressed	정하중(static load)이 미리 주어진 상황에서의 고유진동수 계산. 구조 비선형이 필요. Stationary 이후 Eigenfrequency 해석.
Frequency Domain, Prestressed	정적 전하중(preload)에서 변동이 일어나는 조화하중응답 계산. 전하중으로부터 강성의 영향을 고려하기 위해 구조 비선형 필요. Stationary 이후 Frequency Domain 적용.
Frequency Domain, Prestressed, Modal	세 가지 study 단계는 미리 주어진 정하중이 주변에서 변동이 일어나는 조화하중응답 계산.
Random Vibration (PSD)	무작위 진동 분석을 위해 Global Definitions 하단의 세 개의 study와 여러 노드 추가.
Response Spectrum	응답 스펙트럼 분석을 위한 Eigenfrequency 해석 단계에 추가.
Time Dependent, Prestressed, Modal	세 가지 study 단계를 사용하여 미리 주어진 정하중 주변에서 변동하는 시간 종속 부하에 대한 응답을 계산.
Stationary, One Way	MEMS 모듈 또는 Structural Mechanics 모듈에서 지원하는 Fluid-Structure Interaction 인터페이스에서 사용. Stationary,

Study (분야별 지원)	설명
	Fluid와 Stationary, Solid가 생성.
Time Dependent, One Way	MEMS 모듈 또는 Structural Mechanics 모듈에서 지원하는 Fluid-Structure Interaction 인터페이스에서 사용. Time Dependent, Fluid와 Time Dependent, Solid가 생성.
Stationary, One Way with Initialization	MEMS 모듈 또는 Structural Mechanics 모듈과 함께 CFD 모듈에서 지원하는 Fluid-Structure Interaction 인터페이스에서 사용. 세 단계의 해석 단계가 만들어짐.
Time dependent, One Way with Initialization	MEMS 모듈 또는 Structural Mechanics 모듈과 함께 CFD 모듈에서 지원하는 Fluid-Structure Interaction 인터페이스에서 사용. 세 단계의 해석 단계가 만들어짐.
Time Dependent with FFT	Time Dependent study 단계를 사용하여 시간 종속 해석을 한 후에 Time to Frequency FFT study 단계를 적용.
Mapping	Background Fluid Flow Coupling을 사용할 때 적용하는 해석 단계.
Transient Mapping	Aeroacoustic Flow Source Coupling 다중 물리 기능에 대한 해석.
Multipurpose Applications	
Adaptive Frequency Sweep	AWE 솔버를 사용하여 주파수 도메인에서 고조파 여기의 선형 또는 선형화된 모델의 주파수 응답을 분석.
Frequency Domain, Modal	모달 해석을 사용하여 주파수 영역의 파동 문제를 분석.
Mode Analysis	고유치 솔버를 이용해 음파 또는 전자기파의 모드 계산.
Modal Reduced-Order Model	하나의 study로서, Eigenfrequency study 단계와 Modal Reduced-Order Model study 단계를 결합합니다. 또한 Modal Reduced-Order Model study 단계를 추가하여, 모달 솔버를 사용해 시간에 따른 파동 문제에 대한 감소된 차수의 모델 행렬을 내보낼 수 있음.
Frequency Domain, AWE Reduced-Order Model	자체가 독립적인 해석 타입은 아니며, ROM 생성을 용이하게 하기 위해 Model Builder 트리에 노드를 추가하여 사용. AWE 기술을 사용하여 주파수 영역 스윕을 위해 ROM을 설정하도록 구성.
Frequency Domain, Modal Reduced-Order Model	자체가 독립적인 해석 타입은 아니며, ROM 생성을 용이하게 하기 위해 Model Builder 트리에 노드를 추가하여 사용. 모드 중첩을 사용하여 주파수 도메인 분석 위해 ROM을 설정하도록 구성.

Study (분야별 지원)	설명
Time Dependent, Modal Reduced-Order Model	자체가 독립적인 해석 타입은 아니며, ROM (reduced-order model) 생성을 용이하게 하기 위해 Model Builder 트리에 노드를 추가하여 사용. 모드 중첩을 사용하여 시간 종속 분석을 위해 ROM을 설정하도록 구성.
Optimization	목적함수와 제어변수를 통해 위상 최적화, 형상 최적화 등 최적화 해석. 솔버에서 직접 구현하거나, Optimization 인터페이스를 통해 해석 가능.
Curve Fitting	시간 종속 모델에 대한 최소 제곱 매개변수 추정을 제공
Shape Optimization	형상 최적화에 이용
Topology Optimization	위상 최적화에 이용
Parameter Estimation	시간 해석 모델에서의 파라미터 추정.
Uncertainty Quantification	불확실성 정량화 해석
Small-Signal Analysis, Frequency Domain	바이어스(bias) 해에서 작은 진동의 섭동주파수영역 계산에 적용. Stationary 이후 Frequency Domain, Perturbation 적용.

부록. 표 2 지원 솔버

Solver	설명
AWE Solver	Asymptotic Waveform Evaluation(AWE)을 통한 파리미터 해석. 주로 파장이 고려되는 모델을 해석할 때 사용함.
Dependent Variables	Initial Values of Variables solved For / Values of Variables Not Solved For에 대한 설정 내용과 배율(scailing)을 처리
Eigenvalue Solver	고유치 해석. 주로 Eigenfrequency 해석 타입에서 적용.
FFT Solver	FFT(Fast Fourier Transform)를 이용하여 시간 종속 또는 주파수 종속 입력에 대한 푸리에 변환을 고려.
Modal Reduction	Random Vibration (PSD) 스터디 생성 시 자동 생성, 1)시간 응답 또는 2)주파수 응답 해석
Modal Solver	모달이 고려되는 모델의 1)시간 응답 또는 2)주파수 응답 해석.
Optimization Solver	최적화. Optimization 모듈 필요.
Plug Flow Solver	Plug flow 반응기 해석. Chemical Reaction Engineering 모듈 필요.
Stationary Solver	정상상태 해석.
Time-Dependent Solver	시변 해석, 시간 단계는 내부적으로 처리.
Time Discrete Solver	시변 해석, 시간 단계는 이산화 처리.
References for the Solution Operation Nodes and Solvers	시변 해석, Runge-Kutta 방법 혹은 3차 Adams-Bashforth 솔버를 사용.

부록. 표 3 Preconditioner

Preconditioner	사용
GENERAL FRAMEWORK	
Multigrid – Geometric multigrid	타원(elliptic) 또는 포물선(parabolic) 시스템
Multigrid – Algebraic multigrid and smoothed aggregation AMG	스칼라 문제 또는 거의 연성이 없는 타원 또는 포물선 타입의 다중물리현상
Domain Decomposition (Schwarz)	분산 메모리 시스템에서의 큰 문제 또는 Direct Solver 대안용
Krylov Preconditioner	메시가 나이퀴스트(Nyquist) 기준을 충족하지 않는 헬름홀츠(Helmholtz) 모델.
FULL OR APPROXIMATE FACTORIZATION OR APPROXIMATE INVERSE	
Incomplete LU	비대칭(nonsymmetric) 시스템
SCGS	BEM이나 일반적인 preconditioner 또는 smoother 단계에서 비용이 많이 드는 설정 단계가 있지만 일반적으로 우수한 병렬 확장성을 보여 줌
Direct Preconditioner	Direct Solver가 유효한 조그마한 영역
POINTWISE GENERAL PURPOSE	
SOR	대각선에 0이 없는 타원 타입 문제. Jacobi와 비교하였을 때 처리속도가 빠름.
Jacobi (diagonal scaling)	큰 정부호(positive definite) 모델
BLOCK GAUSS-SEIDEL GENERAL PURPOSE	
SCGS	선형 요소(linear element)를 지닌 유체 문제
SOR Line	SOR과 유사하나, 비등방성 메시을 적용한 모델. SOR보다 처리속도가 느림.
Vanka	시스템 행렬의 대각선에 0을 지닌 큰 부정수(indefinite) 문제
VECTOR ELEMENT METHODS	
Auxiliary-Space AMG	벡터 요소를 사용한 복잡한 값의 RF 문제 및 기타 시뮬레이션에 사용
Auxiliary-Space Maxwell (AMS)	정상상태 또는 시변 맥스웰(Maxwell) 식에서 파생한 컬(curl)-컬(curl) 문제
SOR Gauge	Ungauged vector element로 된 Magnetostatics 현상
SOR Vector	벡터 요소를 적용한 모델이 큰 전자기 분야.
METHOD FOR FLUID FLOW SIMULATIONS	

Block Navier-Stokes	과도 영역(transient regime)에서 비압축성 Navier-Stokes 방정식을 사용하는 유체 흐름 모델

부록. 표 4 Plot Groups

메뉴	설명
Admittance Graph	S파라미터 결과에서 어드미턴스 스미스 플롯으로 도출
Annotation	그래프에 주석을 추가합니다.
Annotation Data	점, 텍스트 및 색상 데이터를 주석으로 표시
Arrow Data	점, 벡터 및 색상 데이터를 화살표로 표시
Arrow Line	선과 모서리에서 벡터 값 도출
Arrow Point	점에서 화살표로 벡터 값 도출
Arrow Surface	면에서 화살표로 벡터 값 도출
Arrow Volume	공간에서 화살표로 벡터 값 도출
Contour (Plot)	등고선으로 값 도출
Contour Series	일련의 등고선 플롯으로 시각화
Coordinate System Volume, Coordinate System Surface, Coordinate System Line, Coordinate System point	부피, 표면, 선, 점에서의 좌표계 도출. 이는 Definitions의 Coordinate Systems에서 설정한 좌표계를 보여줌
Directivity	스피커에 대한 방향성을 도출. Acoustics Module 모듈 필요
Function	정의된 함수를 그래프로 도출
Global	시간 또는 파라미터를 포함한 함수 형식으로 된 전역 스칼라 값 도출
Histogram	수량 분포를 보여주는 히스토그램 도출
Image	면에 외부 이미지를 나타냄
Impedance Graph	S파라미터 결과에서 임피던스 스미스 플롯으로 도출
Impulse Response	임펄스 응답 도출. Acoustics Module 모듈 필요
Interference Pattern	단면을 관통하는 다수의 광 간섭에 의한 단면에서의 세기를 보여줌
Isosurface (Plot)	동표면에서의 값 도출
Joint Probability Distribution	결합 확률 분포 도출
Layered Material Slice	지정된 두께 위치에서 슬라이스 플롯으로 계층화된 셸 양을 도출. Composite Materials, AC/DC 또는 Heat Transfer 모듈 필요
Line	선에서의 값을 도출
Line Data	선으로 점, 요소, 색상 데이터 도출
Line Graph	형상 모서리 또는 지정한 선에서의 값 도출
Line Segments	그래프에 선분을 표현
Matrix Histogram	2차원 히스토그램으로 생성하기 원하는 선계산된 매트릭스 적용

메뉴	설명
Max/Min Volume, Max/Min Surface, Max/Min Line, Max/Min Point	공간, 면, 선, 점에서의 최대/최소 값 도출
Mesh (Plot)	생성된 메시 정보 도출
Multislice	3차원 공간 내에서 세 방향 슬라이스에서의 값 도출
Nyquist	주파수응답의 값(magnitude)과 상(phase)을 보여주는 Nyquist 선도 도출
Octave Band	주파수대역에서 주파수 반응을 도출
Optical Aberration	2차원 공간 내에서 단색 수차의 다양한 형태를 도출
Particle (Plot)	시간에 대한 전체 입자가 갖는 물리량 또는 한 입자의 물리량 값 변화를 도출
Particle Tracing	유체 흐름 내의 무질량 입자에 대한 결과 도출. ODE 솔버를 사용하여 자체 계산. 입자는 유체에 영향을 주지 않음
Particle Tracing with Mass	유체 흐름 내의 질량이 존재하는 입자에 대한 결과 도출. ODE 솔버를 이용하여 자체 계산. 입자는 유체에 영향을 주지 않음
Particle Trajectories and Filter for Particle Trajectories	Particle Tracing 모듈을 이용하여 해석된 입자 궤적 도식화
Pellets	3차원에서 펠릿을 구 또는 슬라이스로 시각화.
Phase Portrait	2차원 또는 2차원 축대칭에서 입자 궤적에 대한 데이터 도출
Poincaré Map	Poincaré map을 이용한 입자 궤적 도출. Datasets의 Particle을 기반으로 Cut Plane을 이용
Point	점에서의 값을 도출
Point Data	점으로 점, 요소, 색상 데이터를 도출
Point Graph	형상 꼭지점 또는 지정한 점에서의 값 도출
Point Trajectories and Filter for Point Trajectories	3차원에서 점의 궤적을 시각화
Polarization	주기 구조 해석 시 회절별로 편광상태를 나타내는 기능입니다.
Principal Stress Volume, Principal Stress Surface, Principal Stress Line	구조해석에서 공간, 표면, 선에서의 주응력과 주변형 도출
Radiation Pattern	전자기 또는 음향 압력 필드의 방사 패턴에 대한 전역 변수 값을 도출
Ray (Plot) and Filter for Ray and Ray Trajectories	시간에 따른 광 변수 값 도출
Ray Trajectories and Filter for Ray and Ray Trajectories	Geometrical Optics (Ray Optics 모듈) 또는 Ray Acoustics (Acoustics 모듈) 식으로 계산된 광 궤적을 보여 줌

메뉴	설명
Reflection Graph	S파라미터 결과에서 반사정보 스미스 플롯으로 도출
Scatter Surface, Scatter Volume	공간과 표면에서의 산포도 도출
Slice	3차원 공간 내에서의 슬라이스로 값 도출
Sobol Index	Sobol 지수 (Uncertainty Quantification 모듈 필요)
Spot Diagram	특정 표면에서의 광학 수차를 도출
Streamline	백터 값을 도출
Streamline Multislice	면 위에 벡터 값을 도출
Streamline Surface	면 위에 벡터 값을 도출
Surface (Plot)	표면에서의 값 도출
Surface Data	면으로 점, 요소, 색상 데이터로 도출
Surface Slit	양쪽 면에 특정 값들을 나타내는 기능입니다
Table Annotation	테이블 형식을 사용하여 주석을 추가
Table Contour	테이블 형식을 사용하여 등고선 도출
Table Graph and Filter for Table Graph	테이블에 있는 데이터 도출
Table Histogram	테이블에 있는 데이터를 기반으로 Histogram을 생성
Table Point	테이블에 있는 점을 도출
Table Surface	테이블에 나온 데이터를 기반으로 2차원 결과를 도출
Through Thickness	지정한 점에서 계층화된 셸 수량의 두께 편차를 표시. Composite Materials, AC/DC 또는 Heat Transfer 모듈 필요
Tube Data	튜브로 점, 요소, 색상 데이터 도출
Volume	부피에서의 값 도출
Waterfall	매개변수 계산시 두 파라미터에 대한 결과 도출
Whirl	이산화된 회전 간격에서 로터 회전축에 대한 모드 형상을 도출
CROSS SECTION PLOTS	

메뉴	설명
1D, 2D, and 3D Cross-Section Point Plots	Point Cross-Section Plot을 사용하면 임의의 공간 좌표에서 표현식을 쉽게 볼 수 있고, 결과적으로 Line Plot 생성.
2D Cross-Section Line Plots and 3D Cross-Section Line Plots	2D 및 3D 형상을 통해 선을 만들어 선을 따라 시각화, Cross-Section Toolbar Buttons 사용방법에 대해 설명.
3D Cross-Section Surface Plot	2D 형상에서 3D 모델을 통해 평면을 생성하여 평면에서 시각화 절단 평면은 3D에 포함된 2D 직교좌표계에 해당, Cross-Section Toolbar Buttons 사용방법에 대해 설명.
PLOT ATTRIBUTES	
Color Expression	결과 값을 색깔로 표현함.
Comparison	그래프 플롯과 테이블 그래프를 비교
Deformation	벡터의 변형을 표현함. 예) 구조 변위
Energy Decay	임펄스 응답 플롯의 에너지 감쇠.
Error Bars (Global, Point Graph, and Function)	그래프에 대한 에러바.
Error Bars (Table Graph)	테이블 그래프에 대한 에러바
Export Expressions	데이터를 내보내는 표현식을 추가.
Filter, Filter for Particle Trajectories, Filter for Point Trajectories, Filter for Ray and Ray Trajectories, and Filter for Table Graph	Filter를 통해 결과의 일부분을 표현함.
Graph Marker	그래프의 최소와 최대 마커와 같은 마커.
Height Expression	2차원 결과에다가 높이의 정보를 적용하여 3차원화.
Image (Plot Attribute)	표면이나 볼륨 이미지 추가
Marker	최소와 최대 마커
Material Apperance	그림에 Material Appearance를 사용
Selection (Plot Attribute)	플롯을 표시할 형상 개체의 선택.
Translation	2D 및 3D 그림에 변환 추가.
Transparency	높이 표현식을 3D 및 2D 그림에 투명도 추가
Visual Effects	높이 표현식을 사용하여 3D 및 2D 그림에 시각 효과 추가

부록. 표 5 COMSOL Multiphysics 인터페이스

AC/DC 모듈			
지배식	**태그**	**차원**	**솔버**
Electric Currents[1]	ec	all dimensions	stationary stationary source sweep frequency domain time dependent small signal analysis, frequency domain eigenfrequency
Electric Currents in Shells	ecis	3D	stationary frequency domain time dependent eigenfrequency
Electric Currents in Layered Shells	ecis	3D	stationary frequency domain time dependent eigenfrequency
Electrical Circuit	cir	Not space dependent	stationary frequency domain time dependent small signal analysis, frequency domain eigenfrequency
Electrostatics[1]	es	all dimensions	stationary time dependent stationary source sweep eigenfrequency frequency domain small signal analysis, frequency domain
Electrostatics, Boundary Elements	esbe	3D, 2D	stationary stationary source sweep frequency domain small signal analysis, frequency domain

AC/DC 모듈			
지배식	**태그**	**차원**	**솔버**
Magnetic Fields[1]	mf	3D, 2D, 2D axisymmetric	stationary frequency domain time dependent small signal analysis, frequency domain coil geometry analysis (3D only) time to frequency losses eigenfrequency
Magnetic Field Formulation	mfh	3D, 2D, 2D axisymmetric	stationary frequency domain time dependent small signal analysis, frequency domain time to frequency losses
Magnetic Fields, No Currents	mfnc	3D, 2D, 2D axisymmetric	stationary frequency domain time dependent time to frequency losses
Magnetic Fields, No Currents, Boundary Elements	mfncbe	3D, 2D	stationary
Magnetic Fields, Currents Only	mfco	3D	stationary stationary source sweep with initialization frequency domain source sweep with initialization
Magnetic and Electric Fields	mef	3D, 2D, 2D axisymmetric	stationary frequency domain time dependent stationary source sweep frequency domain source sweep coil geometry analysis (3D only)

AC/DC 모듈			
지배식	**태그**	**차원**	**솔버**
Rotating Machinery, Magnetic	rmm	3D, 2D	stationary time dependent, coil geometry analysis (3D only) frequency domain time to frequency losses
Magnetic Machinery, Rotating, Time Periodic	mmtp	2D	stationary time dependent frequency domain
Magnetohydrodynamics	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency-stationary frequency-transient
Particle Tracing			
Particle Field Interaction, Nonrelativistic[4]	—	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Particle Field Interaction, Relativistic[4]	—	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Charged Particle Tracing[4]	cpt	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Heat Transfer			
Electromagnetic Heating			
Induction Heating[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency-stationary frequency-transient frequency-stationary, one-way electromagnetic heating frequency-transient, one-way electromagnetic

AC/DC 모듈			
지배식	**태그**	**차원**	**솔버**
			heating small-signal analysis, frequency domain
Joule Heating[1,2]	—	all dimensions	stationary time dependent frequency-transient small-signal analysis frequency domain frequency-stationary frequency-stationary, one-way electromagnetic heating frequency-transient, one-way electromagnetic heating
Structural Mechanics			
Thermal–Structure Interaction			
Joule Heating and Thermal Expansion[2,3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Electromechanics			
Electromechanics[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency, prestressed time dependent frequency domain, prestressed
Electromechanics, Boundary Elements[2,3]	—	3D, 2D	stationary eigenfrequency, prestressed time dependent frequency domain, prestressed
Piezoelectricity			

AC/DC 모듈			
지배식	**태그**	**차원**	**솔버**
Piezoelectricity, Solid[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal small-signal analysis, frequency domain linear buckling
Piezoelectricity, Layered Shell[2,7]	—	3D	stationary eigenfrequency time dependent frequency domain
Magnetomechanics			
Piezomagnetism[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Nonlinear, Magnetostriction[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed

AC/DC 모듈			
지배식	**태그**	**차원**	**솔버**
			frequency domain, prestressed
Magnetomechanics[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetomechanics, No Currents[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetic–Elastic Interaction in Rotating Machinery[2,5]	—	3D, 2D	stationary time dependent frequency domain

AC/DC 모듈			
지배식	**태그**	**차원**	**솔버**
Magnetic–Rigid Body Interaction in Rotating Machinery[2,6]	—	3D, 2D	stationary time dependent frequency domain
Electrostriction			
Ferroelectroelasticity[2,3]	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain
Electrostriction[2,3]	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain
Piezoresistivity			

[1] 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함되어 있습니다.

[2] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

[3] Structure Mechanics Module 또는 MEMS Module을 필요로 합니다.

[4] Particle Tracing Module을 필요로 합니다.

[5] Structural Mechanics Module을 필요로 합니다.

[6] Multibody Dynamics Module을 필요로 합니다.

[7] Composite Materials Module을 필요로 합니다.

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
Pressure Acoustics			
Pressure Acoustics, Frequency Domain[1]	acpr	all dimensions	eigenfrequency frequency domain frequency domain, modal adaptive frequency sweep mode analysis (2D and 1D axisymmetric models only) boundary mode analysis (3D and 2D axisymmetric models only)
Pressure Acoustics, Transient	actd	all dimensions	eigenfrequency frequency domain frequency domain, modal time dependent time dependent, modal mode analysis (2D and 1D axisymmetric models only)
Pressure Acoustics, Boundary Mode	acbm	3D, 2D axisymmetric	mode analysis
Pressure Acoustics, Boundary Elements	pabe	3D, 2D	frequency domain
Pressure Acoustics, Time Explicit	pate	3D, 2D, 2D axisymmetric	time dependent
Pressure Acoustics, Asymptotic Scattering	paas	3D	frequency domain
Pressure Acoustics, Kirchhoff–Helmholtz	pakh	3D	frequency domain

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
Elastic Waves			
Slid Mechanics (Elastic Waves)[1]	solid	3D, 2D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed mode analysis time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model frequency domain, AWE reduced-order model modal reduced-order model
Poroelastic Waves	pelw	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal
Elastic Waves, Time Explicit	elte	3D, 2D, 2D axisymmetric	time dependent
Piezoelectric Waves, Time Explicit	—	3D, 2D, 2D axisymmetric	time dependent
Acoustic-Structure Interaction			
Acoustic-Solid Interaction, Frequency Domain[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
Acoustic-Solid Interaction, Transient[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal time dependent time dependent, modal
Acoustic-Shell Interaction, Frequency Domain[2,3]	—	3D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal
Acoustic-Shell Interaction, Transient[2,3]	—	3D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal time dependent time dependent, modal
Acoustic-Piezoelectric Interaction, Frequency Domain[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal
Acoustic-Piezoelectric Interaction, Transient[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal time dependent time dependent, modal
Acoustic-Solid-Poroelas tic Waves Interaction[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal
Acoustic-Poroelastic Waves Interaction[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal
Acoustic-Solid Interaction, Time Explicit	—	3D, 2D	time domain
Aeroacoustics			
Linearized Euler, Frequency	lef	3D, 2D, 2D	frequency domain

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
Domain		axisymmetric, 1D	eigenfrequency
Linearized Euler, Transient	let	3D, 2D, 2D axisymmetric, 1D	time dependent
Linearized Euler, Boundary Mode	lebm	3D, 2D axisymmetric	mode analysis
Linearized Potential Flow, Frequency Domain	ae	all dimensions	frequency domain mode analysis (2D and 1D axisymmetric models only)
Linearized Potential Flow, Transient	aetd	all dimensions	frequency domain time dependent mode analysis (2D and 1D axisymmetric models only)
Linearized Potential Flow, Boundary Mode	aebm	3D, 2D axisymmetric	mode analysis
Compressible Potential Flow	cpf	all dimensions	stationary time dependent
Linearized Navier-Stokes, Frequency Domain	lnsf	3D, 2D, 2D axisymmetric, 1D	frequency domain eigenfrequency
Linearized Navier-Stokes, Transient	lnst	3D, 2D, 2D axisymmetric, and 1D	time dependent
Linearized Navier-Stokes, Boundary Mode	lnsbm	3D, 2D axisymmetric	mode analysis
Thermoviscous Acoustics			
Thermoviscous Acoustics, Frequency Domain	ta	all dimensions	eigenfrequency frequency domain frequency domain, modal

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
			mode analysis (2D and 1D axisymmetric models only)
Thermoviscous Acoustics, Transient	tatd	all dimensions	time dependent
Thermoviscous Acoustics, Boundary Mode	tabm	3D, 2D axisymmetric	mode analysis
Acoustic-Thermoviscous Acoustic Interaction, Frequency Domain[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal boundary mode analysis (3D and 2D axisymmetric only) mode analysis (2D only)
Thermoviscous Acoustic-Solid Interaction, Frequency Domain[3]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequency domain frequency domain, modal mode analysis (2D only)
Thermoviscous Acoustic-Shell Interaction, Frequency Domain[2,3]	—	3D	eigenfrequency frequency domain frequency domain, modal
Thermoviscous Acoustic–Thermoelasticity Interaction, Frequency Domain[5]	—	3D, 2D, 2D axisymmetric	frequency domain perturbation
Thermoviscous Acoustic–Thermoelasticity Interaction, Transient[5]	—	3D, 2D, 2D axisymmetric	time dependent
Ultrasound			
Convected Wave Equation, Time Explicit	cwe	3D, 2D, 2D axisymmetric	time dependent
Nonlinear Pressure Acoustics, Time Explicit	nate	3D, 2D, 2D axisymmetric	time dependent
Geometrical Acoustics			

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
Ray Acoustics	rac	3D, 2D, 2D axisymmetric	ray tracing time dependent
Acoustic Diffusion Equation	ade	3D	eigenvalue stationary time dependent
Pipe Acoustics			
Pipe Acoustics, Frequency Domain	pafd	3D, 2D	eigenfrequency frequency domain
Pipe Acoustics, Transient	patd	3D, 2D	time dependent
Structural Mechanics			
Solid Mechanics[1]	solid	3D, 2D, 2D Axisymmetric, 1D, 1D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed mode analysis time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model frequency domain, AWE reduced-order model
Piezoelectricity			

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
Piezoelectricity, Solid[3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal small-signal analysis, frequency domain
Magnetomechanics			
Piezomagnetism[3,4]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Nonlinear Magnetostriction[3,4]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetomechanics[3,4]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent

Acoustic 모듈			
지배식	**태그**	**차원**	**솔버**
			frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetomechanics, No Currents[3,4]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed

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[2] Structure Mechanics Module 및 Acoustics Module이 필요합니다.

[3] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

[4] AC/DC Module이 필요합니다.

[5] MEMS Module 및 Acoustics Module이 필요합니다.

Battery Design 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Transport of Diluted Species	tds	all dimensions	stationary time dependent
Transport of Concentrated Species	tcs	all dimensions	stationary time dependent
Chemistry	chem	all dimensions	stationary time dependent
Nernst-Planck-Poisson Equations	tds+es	all dimensions	stationary time dependent stationary source sweep small-signal analysis, frequency domain
Electrophoretic Transport	el	all dimensions	stationary stationary with initialization time dependent time dependent with initialization
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Transport of Concentrated Species in Porous Media	tcs	all dimensions	stationary time dependent
Surface Reactions	sr	all dimensions	stationary (3D, 2D, and 2D axisymmetric models only) time dependent
Transport of Diluted Species in Fractures	dsf	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow, Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent

Battery Design 모듈			
지배식	**태그**	**차원**	**솔버**
Nonisothermal Reacting Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow in Porous Media			
Transport of Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Concentrated Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Electrochemistry			
Primary Current Distribution Secondary Current Distribution	cd	all dimensions	stationary stationary with initialization time dependent time dependent with initialization AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Tertiary Current Distribution, Nernst-Planck (Electroneutrality, Water-Based with Electroneutrality, Supporting Electrolyte)	tcd	all dimensions	stationary stationary with initialization time dependent time dependent with initialization AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Electroanalysis	tcd	all dimensions	stationary time dependent AC impedance, initial values AC impedance, stationary AC impedance, time dependent cyclic voltammetry
Electrode, Shell	els	3D, 2D, 2D axisymmetric	stationary time dependent

Battery Design 모듈			
지배식	**태그**	**차원**	**솔버**
Battery Interfaces			
Lithium-Ion Battery (Binary 1:1 Liquid Electrolyte, Single-Ion Conductor)	liion	all dimensions	stationary time dependent AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Battery with Binary Electrolyte	batbe	all dimensions	stationary time dependent AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Lead-Acid Battery	leadbat	all dimensions	stationary time dependent AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Single Particle Battery	spb	all dimensions	time dependent time dependent with initialization
Lumped Battery	lb	all dimensions	time dependent AC impedance, initial values
Battery Equivalent Circuit	ec	Not space dependent	stationary time dependent frequency domain
Battery Pack	Bp	3D	time dependent
Fluid Flow			
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent

Battery Design 모듈			
지배식	**태그**	**차원**	**솔버**
Darcy's Law	dl	all dimensions	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Heat Transfer			
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Transport of Diluted Species[1]	tds	all dimensions	stationary time dependent
Transport of Concentrated Species	tcs	all dimensions	stationary time dependent
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Transport of Concentrated Species in Porous Media	tcs	all dimensions	stationary time dependent
Vapor Flow			
Laminar Flow, Concentrated Species[3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow, Concentrated Species, Moving Mesh[3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, Concentrated Species			
Turbulent Flow, k-ε[3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, k-ω[3]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, SST[3]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε[3]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Reacting Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow, Diluted Species[1]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow			
Turbulent Flow, k-ε	—	3D, 2D, 2D axisymmetric	stationary time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Turbulent Flow, k-ω	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, SST	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, Diluted Species			
Turbulent Flow, k-ε	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, k-ω	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, SST	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
High Mach Number Reacting Flow			
Laminar Flow[3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow, Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow[3]			
Turbulent Flow, k-ε[3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, Spalart–Allmaras[3]	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, Diluted Species			
Turbulent Flow, k-ε	—	3D, 2D, 2D axisymmetric	stationary time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Turbulent Flow, Spalart–Allmaras	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Reacting Flow in Porous Media			
Transport of Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Concentrated Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Dispersed Two-Phase Flow with Species Transport			
Laminar Flow		3D, 2D	stationary time dependent
Turbulent Flow			
Turbulent Flow, k-ε	—	3D, 2D	stationary time dependent
Turbulent Flow, k-ω	—	3D, 2D	stationary time dependent
Turbulent Flow, SST	—	3D, 2D	stationary with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε	—	3D, 2D	stationary with initialization time dependent with initialization
Fluid Flow			
Single-Phase Flow			
Creeping Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow[1]	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Viscoelastic Flow	vef	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow			
Turbulent Flow, Algebraic yPlus	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Turbulent Flow, L-VEL	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, k-ε	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, Realizable k-ε	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, k-ω	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, SST	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, Spalart-Allmaras	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Turbulent Flow, v2-f	spf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Large Eddy Simulation			
LES RBVM	spf	3D	time dependent
LES RBVMWV	spf	3D	time dependent
LES Smagorinsky	spf	3D	time dependent
Detached Eddy Simulation			
DES RBVM, Spalart–Allmaras	spf	3D	time dependent
DES RBVMWV, Spalart–Allmaras	spf	3D	time dependent
DES Smagorinsky, Spalart–Allmaras	spf	3D	time dependent
Rotating Machinery, Fluid Flow			

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Rotating Machinery, Laminar Flow	spf	3D, 2D	frozen rotor time dependent
Rotating Machinery, Turbulent Flow, Algebraic yPlus	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Turbulent Flow, L-VEL	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Turbulent Flow, k-ε	spf	3D, 2D	frozen rotor time dependent
Potential Flow			
Incompressible Potential Flow	ipf	3D, 2D, 2D axisymmetic	stationary
Compressible Potential Flow	cpf	all dimensions	stationary time dependent
Multiphase Flow			
Bubbly Flow			
Laminar Bubbly Flow	bf	3D, 2D, 2D axisymmetric	stationary time dependent
Bubbly Flow, Turbulent Flow			
Bubbly Flow, Algebraic yPlus	bf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Bubbly Flow, L-VEL	bf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Bubbly Flow, k-ε	bf	3D, 2D, 2D axisymmetric	stationary time dependent
Bubbly Flow, Realizable k-ε	bf	3D, 2D, 2D axisymmetric	stationary time dependent
Bubbly Flow, k-ω	bf	3D, 2D, 2D axisymmetric	stationary time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Bubbly Flow, SST	bf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Bubbly Flow, Low Re k-ε	bf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Bubbly Flow, Spalart-Allmaras	bf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Bubbly Flow, v2-f	bf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Mixture Model			
Mixture Model, Laminar Flow	mm	3D, 2D, 2D axisymmetric	stationary time dependent
Mixture Model, Turbulent Flow			
Mixture Model, Algebraic yPlus	mm	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Mixture Model, L-VEL	mm	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Mixture Model, k-ε	mm	3D, 2D, 2D axisymmetric	stationary time dependent
Mixture Model, Realizable k-ε	mm	3D, 2D, 2D axisymmetric	stationary time dependent
Mixture Model, k-ω	mm	3D, 2D, 2D axisymmetric	stationary time dependent
Mixture Model, SST	mm	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Mixture Model, Low Re k-ε	mm	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Mixture Model, Spalart-Allmaras	mm	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Mixture Model, v2-f	mm	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Euler-Euler Model			
Euler-Euler Model, Laminar Flow	ee	3D, 2D, 2D axisymmetric	stationary time dependent
Euler-Euler Model, Turbulent Flow	ee	3D, 2D, 2D axisymmetric	stationary time dependent
Phase Transport Mixture Model			
Phase Transport, Mixture Model, Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Phase Transport, Mixture Model, Algebraic yPlus	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Phase Transport, Mixture Model, L-VEL	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Phase Transport, Mixture Model, k-ε	—	3D, 2D, 2D axisymmetric	stationary time dependent
Phase Transport, Mixture Model, Realizable k-ε	—	3D, 2D, 2D axisymmetric	stationary time dependent
Phase Transport, Mixture Model, k-ω	—	3D, 2D, 2D axisymmetric	stationary time dependent
Phase Transport, Mixture Model, SST	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Phase Transport, Mixture Model, Low Re k-ε	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Phase Transport, Mixture Model, Spalart-Allmaras	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Phase Transport, Mixture Model, v2-f	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Nonisothermal Mixture Model			

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Nonisothermal Mixture Model, Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Mixture Model, Algebraic yPlus	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Nonisothermal Mixture Model, L-VEL	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Nonisothermal Mixture Model, k-ε	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Mixture Model, Realizable k-ε	—	3D, 2D, 2D axisymmetric	stationar time dependent
Nonisothermal Mixture Model, k-ω	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Mixture Model, SST	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Nonisothermal Mixture Model, Low Re k-ε	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Nonisothermal Mixture Model, Spalart-Allmaras	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Nonisothermal Mixture Model, v2-f	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Two-Phase Flow, Moding Mesh			
Laminar Two-Phase Flow, Moving Mesh	—	3D, 2D, 2D axisymmetric	time dependent
Two-Phase Flow, Level Set			
Laminar Two-Phase Flow, Level Set	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Level Set, Algebraic yPlus	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Level Set,	—	3D, 2D, 2D	time dependent with initialization

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
L-VEL		axisymmetric	
Two-Phase Flow, Level Set, k-ε	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Level Set, Realizable k-ε	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Level Set, k-ω	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Level Set, SST	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Level Set, Low Re k-ε	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Level Set, Spalart-Allmaras	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Level Set, v2-f	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Phase Field			
Laminar Two-Phase Flow, Phase Field	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Phase Field, Algebraic yPlus	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Phase Field, L-VEL	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Phase Field, k-ε	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Phase Field, Realizable k-ε	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Phase Field, k-ω	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Phase Field, SST	—	3D, 2D, 2D axisymmetric	time dependent with initialization

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Two-Phase Flow, Phase Field, Low Re k-ε	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Phase Field, Spalart-Allmaras	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Phase Field, v2-f	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Thin-Film Flow Phase Flow, Phase Field			
Two-Phase Thin-Film Flow, Phase Field	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Three-Phase Flow, Phase Field			
Laminar, Three-Phase Flow, Phase Field	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Phase Transport			
Phase Transport	phtr	all dimensions	stationary time dependent
Phase Transport in Porous Media	phtr	all dimensions	stationary time dependent
Phase Transport in Free and Porous Media Flow	phtr	all dimensions	stationary time dependent
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Multiphase Flow in Porous Media	—	all dimensions	stationary time dependent
Multiphase Free and Porous Media Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Two-Phase Darcy's Law	tpdl	3D, 2D, 2D axisymmetric	stationary time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Thin-Film and Porous Media Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain
Nonisothermal Flow			
Laminar Flow[1,2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Viscoelastic Flow	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow			
Turbulent Flow, Algebraic yPlus[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, L-VEL[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, k-ε[2]	—	3D, 2D, 2D	stationary

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
		axisymmetric	time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, Realizable k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, k-ω[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, SST[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, Low Re k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, Spalart-Allmaras[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, v2-f[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Large Eddy Simulation			
LES RBVM	—	3D	time dependent
LES RBVMWV	—	3D	time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
LES Smagorinsky	—	3D	time dependent
High Mach Number Flow			
High Mach Number Flow, Laminar	hmnf	3D, 2D, 2D axisymmetric	stationary time dependent
High Mach Number Flow, Algebraic yPlus	hmnf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
High Mach Number Flow, L–VEL	hmnf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
High Mach Number Flow, Spalart-Allmaras	hmnf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
High Mach Number Flow, k-ε	hmnf	3D, 2D, 2D axisymmetric	stationary time dependent
High Mach Number Flow, Realizable k-ε	hmnf	3D, 2D, 2D axisymmetric	stationary time dependent
High Mach Number Flow, k-ω	hmnf	3D, 2D, 2D axisymmetric	stationary time dependent
High Mach Number Flow, SST	hmnf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
High Mach Number Flow, Low Reynolds Number k-ε	hmnf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
High Mach Number Flow, v2-f	hmnf	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization
Compressible Euler Equations	cee	3D, 2D	time dependent
Rotating Machinery, High Mach Number Flow			
High Mach Number Flow, Laminar	—	3D, 2D	frozen rotor time dependent
High Mach Number Flow, k-ε	—	3D, 2D	frozen rotor time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
High Mach Number Flow, Spalart-Allmaras	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Fluid-Structure Interaction			
Fluid-Solid Interaction, Fixed Geometry[2]	—	3D, 2D, 2D axisymmetric	stationary stationary, one way time dependent time dependent, one way
Fluid-Solid Interaction, Two-Phase Flow, Phase Field, Fixed Geometry[2]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Solid–Thin-Film Damping[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain
Thin-Film Flow			
Thin-Film Flow	tff	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain eigenfrequency
Thin-Film Flow, Domain	tff	2D	stationary time dependent frequency domain eigenfrequency
Shallow Water Equations			
Shallow Water Equations, Time Explicit	swe	1D and 2D	time dependent
Heat Transfer			
Heat Transfer in Fluids[1]	ht	all dimensions	stationary time dependent

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Heat Transfer in Solids and Fluids[1]	ht	all dimensions	stationary time dependent
Conjugate Heat Transfer			
Laminar Flow[(1,2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow			
Turbulent Flow, Algebraic yPlus[(2)]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, L-VEL[(2)]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, k-ε[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, Realizable k-ε[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, k-ω[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, SST[(2)]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
			stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, Low Re k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, Spalart-Allmaras[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, v2-f[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization time dependent with initialization stationary, one-way NITF time dependent, one-way NITF
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent
Structural Mechanics			
Mathematics			
Moving Interface			
Level Set	ls	all dimensions	time dependent with phase initialization
Level Set in Porous Media	ls	all dimensions	time dependent with phase initialization
Phase Field in Fluids	pf	all dimensions	time dependent time dependent with phase initialization
Phase Field Thin-Film Flow	pftff	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Ternary Phase Field	terpf	3D, 2D, 2D axisymmetric	time dependent
Phase Field Thin-Film Flow, Edge	pftffs	2D, 2D axisymmetric	time dependent with phase initialization

CFD 모듈			
지배식	**태그**	**차원**	**솔버**
Ternary Phase Field	terpf	3D, 2D, 2D axisymmetric	time dependent

[1] 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함되어 있습니다.

[2] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

[3] Chemical Reaction Engineering Module이 필요합니다.

Chemical Reaction Engineering 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Transport of Diluted Species[1]	tds	all dimensions	stationary time dependent
Transport of Concentrated Species	tcs	all dimensions	stationary time dependent
Chemistry	chem	all dimensions	stationary time dependent
Reaction Engineering	re	0D	time dependent stationary plug flow
Nernst-Planck Equations	npe	all dimensions	stationary time dependent
Nernst-Planck-Poisson Equations	tds+es	all dimensions	stationary time dependent stationary source sweep small-signal analysis, frequency domain
Electrophoretic Transport	el	all dimensions	stationary stationary with initialization time dependent time dependent with initialization
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Transport of Concentrated Species in Porous Media	tcs	all dimensions	stationary time dependent
Surface Reactions	sr	all dimensions	stationary (3D, 2D, and 2D axisymmetric models only) time dependent
Transport of Diluted Species in Fractures	dsf	3D, 2D, 2D axisymmetric	stationary time dependent
Vapor Flow			

Chemical Reaction Engineering 모듈			
지배식	**태그**	**차원**	**솔버**
Laminar Flow, Concentrated Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow, Concentrated Species, Moving Mesh	—	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow, Diluted Species[1]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Reacting Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow in Porous Media			
Transport of Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Concentrated Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Diluted Species, Porous Catalyst	—	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Concentrated Species, Porous Catalyst	—	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Diluted Species, Packed Bed	—	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Concentrated Species, Packed Bed	—	3D, 2D, 2D axisymmetric	stationary time dependent

Chemical Reaction Engineering 모듈			
지배식	**태그**	**차원**	**솔버**
Transport of Diluted Species, Packed Bed, Shrinking Core Model	—	3D, 2D, 2D axisymmetric	stationary time dependent
Dispersed Two-Phase Flow with Species Transport			
Laminar Flow	—	3D, 2D	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Creeping Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow[1]	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Heat Transfer			
Heat Transfer in Fluids[1]	ht	all dimensions	stationary

Chemical Reaction Engineering 모듈			
지배식	**태그**	**차원**	**솔버**
			time dependent
Heat Transfer in Solids and Fluids[1]	ht	all dimensions	stationary time dependent
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent
[1] 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함되어 있습니다.			

Corrosion 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Transport of Diluted Species	tds	all dimensions	stationary time dependent
Chemistry	chem	all dimensions	stationary time dependent
Nernst-Planck-Poisson Equations	tds+es	all dimensions	stationary time dependent stationary source sweep small-signal analysis, frequency domain
Electrophoretic Transport	el	all dimensions	stationary stationary with initialization time dependent time dependent with initialization
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Surface Reactions	sr	all dimensions	stationary (3D, 2D, and 2D axisymmetric models only) time dependent
Transport of Diluted Species in Fractures	dsf	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow			
Laminar Flow, Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Electrochemistry			
Primary Current Distribution Secondary Current Distribution	cd	all dimensions	stationary stationary with initialization time dependent time dependent with initialization AC impedance, initial values AC impedance, stationary AC impedance, time dependent

Corrosion 모듈			
지배식	**태그**	**차원**	**솔버**
Tertiary Current Distribution, Nernst-Planck (Electroneutrality, Water-Based with Electroneutrality, Supporting Electrolyte)	tcd	all dimensions	stationary stationary with initialization time dependent time dependentwith initialization AC impedance, initial values ACimpedance, stationary AC impedance, time dependent
Current Distribution, Boundary Element	cdbem	3D, 2D	stationary stationary with initialization time dependent time dependentwith initialization AC impedance, initial values ACimpedance, stationary AC impedance, time dependent
Current Distribution, Shell	cdsh	3D, 2D, 2D axisymmetric	stationary stationary with initialization time dependent time dependentwith initialization AC impedance, initial values ACimpedance, stationary AC impedance, time dependent
Current Distribution, Pipe	cdpipe	3D	stationary stationary with initialization time dependent time dependentwith initialization AC impedance, initial values ACimpedance, stationary AC impedance, time dependent

Corrosion 모듈			
지배식	**태그**	**차원**	**솔버**
Electroanalysis	tcd	all dimensions	stationary time dependent AC impedance, initial values AC impedance, stationary AC impedance, time dependent cyclic voltammetry
Electrode, Shell	els	3D, 2D, 2D axisymmetric	stationary time dependent
Cathodic Protection	cp	all dimensions	stationary stationary with initialization time dependent time dependentwith initialization AC impedance, initial values ACimpedance, stationary AC impedance, time dependent
Corrosion, Deformed Geometry			
Corrosion, Primary Corrosion, Secondary	cd + dg	all dimensions	stationary stationary with initialization time dependent time dependentwith initialization AC impedance, initial values ACimpedance, stationary AC impedance, time dependent
Corrosion, Tertiary with (Electroneutrality, Supporting Electrolyte)	tcd + dg	all dimensions	stationary stationary with initialization time dependent time dependentwith initialization AC impedance, initial values ACimpedance, stationary AC impedance, time dependent

Corrosion 모듈			
지배식	태그	차원	솔버
Fluid Flow			
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Heat Transfer			
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent
Moving Interface			
Level Set	ls	all dimensions	time dependent with phase initialization
Phase Field	pf	all dimensions	time dependent time dependent with phase initialization

Electrochemistry 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Transport of Diluted Species	tds	all dimensions	stationary time dependent
Chemistry	chem	all dimensions	stationary time dependent
Nernst-Planck-Poisson Equations	tds+es	all dimensions	stationary time dependent stationary source sweep small-signal analysis frequency domain
Electrophoretic Transport	el	all dimensions	stationary stationary with initialization time dependent time dependent with initialization
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Surface Reactions	sr	all dimensions	stationary (3D, 2D, and 2D axisymmetric models only) time dependent
Reacting Flow			
Laminar Flow, Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Electrochemistry			
Primary Current Distribution Secondary Current Distribution	cd	all dimensions	stationary stationary with initialization time dependent time dependent with initialization AC impedance, initial value AC impedance, stationary AC impedance, time dependent

Electrochemistry 모듈			
지배식	**태그**	**차원**	**솔버**
Tertiary Current Distribution, Nernst-Planck (Electroneutrality, Water-Based with Electroneutrality, Supporting Electrolyte)	tcd	all dimensions	stationary stationary with initialization time dependent time dependent with initialization AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Electroanalysis	tcd	all dimensions	stationary time dependent AC impedance, initial values AC impedance, stationary AC impedance, time dependent cyclic voltammetry
Electrode, Shell	els	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid Flow			
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Brinkman, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			

Electrochemistry 모듈			
지배식	**태그**	**차원**	**솔버**
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Heat Transfer			
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent

Fatigue 모듈			
지배식	**태그**	**차원**	**솔버**
Structural Mechanics			
Fatigue[1]	ftg	3D, 2D, 2D axisymmetric	fatigue stationary
[1] Structural Mechanics Module이 필요합니다.			

Fuel Cell & Electrolyzer 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Transport of Diluted Species	tds	all dimensions	stationary time dependent
Transport of Concentrated Species	tcs	all dimensions	stationary time dependent
Chemistry	chem	all dimensions	stationary time dependent
Nernst-Planck-Poisson Equations	tds+es	all dimensions	stationary time dependent stationary source sweep small-signal analysis, frequency domain
Electrophoretic Transport	el	all dimensions	stationary stationary with initialization time dependent time dependent with initialization
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Transport of Concentrated Species in Porous Media	tcs	all dimensions	stationary time dependent
Surface Reactions	sr	all dimensions	stationary (3D, 2D, and 2D axisymmetric models only) time dependent
Transport of Diluted Species in Fractures	dsf	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow, Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent

Fuel Cell & Electrolyzer 모듈			
지배식	**태그**	**차원**	**솔버**
Nonisothermal Reacting Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow in Porous Media			
Transport of Diluted Species	rfds	3D, 2D, 2D axisymmetric	stationary time dependent
Transport of Concentrated Species	rfcs	3D, 2D, 2D axisymmetric	stationary time dependent
Electrochemistry			
Primary Current Distribution Secondary Current Distribution	cd	all dimensions	stationary stationary with initialization time dependent time dependent with initialization AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Tertiary Current Distribution, Nernst-Planck (Electroneutrality, Water-Based with Electroneutrality, Supporting Electrolyte)	tcd	all dimensions	stationary stationary with initialization time dependent time dependent with initialization AC impedance, initial values AC impedance, stationary AC impedance, time dependent
Electroanalysis	tcd	all dimensions	stationary time dependent AC impedance, initial values AC impedance, stationary AC impedance, time dependent cyclic voltammetry

Fuel Cell & Electrolyzer 모듈			
지배식	**태그**	**차원**	**솔버**
Electrode, Shell	els	3D, 2D, 2D axisymmetric	stationary time dependent
Hydrogen Fuel Cell Interfaces	fc	all dimensions	stationary time dependent frequency domain
Water Electrolyzer Interfaces	fc	all dimensions	stationary time dependent frequency domain
Fluid Flow			
Multiphase Flow			
Bubbly Flow			
Laminar Bubbly Flow	bf	3D, 2D, 2D axisymmetric	stationary time dependent
Mixture Model			
Mixture Model, Laminar Flow	mm	3D, 2D, 2D axisymmetric	stationary time dependent
Euler-Euler Model			
Euler-Euler Model, Laminar Flow	ee	3D, 2D, 2D axisymmetric	stationary time dependent
Phase Transport Mixture Model			
Phase Transport, Mixture Model, Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Phase Transport			
Phase Transport	phtr	all dimensions	stationary time dependent
Phase Transport in Porous Media	phtr	all dimensions	stationary time dependent

Fuel Cell & Electrolyzer 모듈			
지배식	**태그**	**차원**	**솔버**
Phase Transport in Free and Porous Media Flow	phtr	all dimensions	stationary time dependent
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Multiphase Flow in Porous Media	—	all dimensions	stationary time dependent
Multiphase Free and Porous Media Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Heat Transfer			
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Moisture Transport			
Moisture Transport in Air	mt	all dimensions	stationary time dependent
Moisture Transport in Porous Media	mt	all dimensions	stationary time dependent
Moisture Transport in Building Materials	mt	all dimensions	stationary time dependent
Moisture Flow			
Laminar Flow[2]	—	all dimensions	stationary time dependent
Turbulent Flow			
Turbulent Flow, Algebraic yPlus[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, L-VEL[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, SST[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, Low Re k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Porous Media Flow[2]	—	all dimensions	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Laminar Flow[1]	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow			
Turbulent Flow,	spf	3D, 2D, 2D	stationary with initialization

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
Algebraic yPlus		axisymmetric	transient with initialization
Turbulent Flow, L-VEL	spf	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, k-ε	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow, SST	spf	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, Low Rek-ε	spf	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Nonisothermal Flow			
Laminar Flow[1,2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Turbulent Flow			
Turbulent Flow, Algebraic yPlus[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, L-VEL[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, SST[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Turbulent Flow, Low Rek-ε[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization
Heat Transfer			
Heat Transfer in Solids[1]	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
Heat Transfer in Fluids[1]	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Heat Transfer in Solids and Fluids[1]	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Conjugate Heat Transfer			
Laminar Flow[1,2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF thermal perturbation, frequency domain
Turbulent Flow			
Turbulent Flow, Algebraic yPlus[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, L-VEL[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization stationary, one-way NITF time dependent, one-way NITF
Turbulent Flow, k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
			thermal perturbation, frequency domain
Turbulent Flow, SST[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF thermal perturbation, frequency domain
Turbulent Flow, Low Re k-ε	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF thermal perturbation, frequency domain
Radiation			
Heat Transfer with Surface-to-Surface Radiation[(2)]	—	all dimensions	stationary time dependent thermal perturbation, frequency domain
Heat Transfer with Orbital Thermal Loads[(2)]	—	3D	time dependent
Heat Transfer with Radiation in Participating Media[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain
Heat Transfer with Radiation in Absorbing-Scattering Media[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain
Heat Transfer with Radiative Beam in Absorbing Media[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain
Surface-to-Surface Radiation	rad	all dimensions	stationary time dependent
Orbital Thermal Loads	otl	3D	time dependent

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
Radiation in Participating Media	rpm	3D, 2D, 2D axisymmetric	stationary time dependent
Radiation in Absorbing-Scattering Media	rasm	3D, 2D, 2D axisymmetric	stationary time dependent
Radiative Beam in Absorbing Media	rbam	3D, 2D, 2D axisymmetric	stationary time dependent
Electromagnetic Heating			
Joule Heating[1,2]	—	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Lumped Thermal System	lts	all dimensions	stationary time dependent
Thin Structures			
Heat Transfer in Shells	htlsh	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Heat Transfer in Films	htlsh	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Heat Transfer in Fractures	htlsh	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Heat and Moisture Transport			
Moist Air[2]	—	all dimensions	stationary

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
			time dependent thermal perturbation, frequency domain
Moist Porous Media[2]	—	all dimensions	stationary time dependent thermal perturbation, frequency domain
Building Materials[2]	—	all dimensions	stationary time dependent thermal perturbation, frequency domain
Heat and Moisture Flow			
Laminar Flow[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF one-way MF time dependent, one-way MF thermal perturbation, frequency domain
Turbulent Flow			
Turbulent Flow, Algebraic yPlus[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization stationary, one-way NITF time dependent, one-way NITF one-way MF time dependent, one-way MF
Turbulent Flow, L-VEL[2]	—	3D, 2D, 2D axisymmetric	stationary with initialization transient with initialization stationary, one-way NITF time dependent, one-way NITF one-way MF time dependent, one-way MF

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
Turbulent Flow, k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF one-way MF time dependent, one-way MF thermal perturbation, frequency domain
Turbulent Flow, SST[2,3]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF one-way MF time dependent, one-way MF thermal perturbation, frequency domain
Turbulent Flow, Low Re k-ε[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF one-way MF time dependent, one-way MF thermal perturbation, frequency domain
Porous Media Flow[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF one-way MF time dependent, one-way MF thermal perturbation, frequency domain
Porous Media			

Heat Transfer 모듈			
지배식	**태그**	**차원**	**솔버**
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Local Thermal Nonequilibrium	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Heat Transfer in Packed Beds	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Bioheat Transfer	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain thermal perturbation, eigenfrequency
Thermoelectric Effect(2)	—	all dimensions	stationary time dependent thermal perturbation, frequency domain

[1] 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함되어 있습니다.

[2] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

MEMS 모듈			
지배식	**태그**	**차원**	**솔버**
AC/DC			
Electric Currents[1]	ec	all dimensions	stationary stationary source sweep frequency domain time dependent small signal analysis, frequency domain eigenfrequency
Electric Currents in Shells	ecis	3D	stationary frequency domain time dependent eigenfrequency
Electric Currents in Layered Shells	ecis	3D	stationary frequency domain time dependent eigenfrequency
Electrical Circuit	cir	Not space dependent	stationary frequency domain time dependent small signal analysis, frequency domain eigenfrequency
Electrostatics[1]	es	all dimensions	stationary time dependent stationary source sweep eigenfrequency frequency domain small signal analysis, frequency domain
Elastic Waves			
Elastic Waves, Time Explicit	elte	3D, 2D, 2D axisymmetric	time dependent
Piezoelectric Waves, Time Explicit	—	3D, 2D, 2D axisymmetric	time dependent

MEMS 모듈			
지배식	**태그**	**차원**	**솔버**
Transport in Solids	ts	all dimensions	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Laminar Flow[1]	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid-Structure Interaction			
Fluid-Solid Interaction[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Conjugate Heat Transfer, Fluid-Solid Interaction[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent;
Fluid-Solid Interaction, Viscoelastic Flow[2,7]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Fluid-Solid Interaction, Two-Phase Flow, Phase Field[2,6]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Solid–Thin-Film Damping[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, modal reduced-order model response spectrum random vibration (PSD)
Shell–Thin-Film Damping[2]	—	3D, 2D axisymmetric	stationary eigenfrequency

MEMS 모듈			
지배식	태그	차원	솔버
			time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, modal reduced-order model response spectrum random vibration (PSD)
Thin-Film Flow			
Thin-Film Flow	tff	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain eigenfrequency
Thin-Film Flow, Domain	tff	2D	stationary time dependent frequency domain eigenfrequency
Electromagnetic Heating			
Joule Heating[1,2]	—	all dimensions	stationary time dependent small-signal analysis frequency domain
Pyroelectricity	—	3D, 2D, 2D axisymmetric	stationary time dependent
Structural Mechanics			

MEMS 모듈			
지배식	**태그**	**차원**	**솔버**
Solid Mechanics[1]	solid	3D, 2D, 2D axisymmetric, 1D, 1D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed mode analysis time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model frequency domain, AWE reduced-order model response spectrum random vibration (PSD) linear buckling
Phase Field Damage[8]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Thermal–Structure Interaction			
Thermal Stress, Solid[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Joule Heating and Thermal Expansion[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Thermoelasticity[2]	—	3D, 2D, 2D axisymmetric	eigenfrequency frequencydomain time dependent

MEMS 모듈			
지배식	**태그**	**차원**	**솔버**
Electromechanics			
Electromechanics[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency, prestressed time dependent frequency domain, prestressed
Electromechanics, Boundary Elements[2]	—	3D, 2D	stationary eigenfrequency, prestressed time dependent frequency domain, prestressed
Piezoelectricity			
Piezoelectricity, Solid[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal small-signal analysis, frequency domain linear buckling
Piezoelectricity, Layered Shell[2,5]	—	3D	stationary eigenfrequency time dependent frequency domain

MEMS 모듈			
지배식	**태그**	**차원**	**솔버**
Piezoelectricity and Pyroelectricity[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal small-signal analysis, frequency domain linear buckling
Magnetomechanics			
Piezomagnetism[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis,frequency domain eigenfrequency, prestressed frequency domain, prestressed
Nonlinear Magnetostriction[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis,frequency domain eigenfrequency, prestressed frequency domain, prestressed

MEMS 모듈			
지배식	**태그**	**차원**	**솔버**
Magnetomechanics[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetomechanics, No Currents[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Electrostriction			
Ferroelectroelasticity[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain
Electrostriction[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain
Piezoresistivity			

MEMS 모듈			
지배식	태그	차원	솔버
Piezoresistivity, Domain Currents[2]	—	3D	stationary eigenfrequency time dependent time dependent, modal frequency domain frequency domain, modal small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Piezoresistivity, Boundary Currents[2]	—	3D	stationary eigenfrequency time dependent time dependent, modal frequency domain frequency domain, modal small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Piezoresistivity, Shell[2,4]	—	3D	stationary time dependent time dependent, modal frequency domain frequency domain, modal small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Piezoresistivity, Layered Shell[2,5]	—	3D	stationary time dependent time dependent, modal frequency domain frequency domain, modal

MEMS 모듈			
지배식	**태그**	**차원**	**솔버**
			small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed

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[3] AC/DC Module이 필요합니다.

[4] Structural Mechanics Module이 필요합니다.

[5] Composite Materials Module이 필요합니다.

[6] CFD Module 또는 Polymer Flow Module 또는 Microfluidics Module이 필요합니다.

[7] Polymer Flow Module이 필요합니다.

[8] Nonlinear Structural Materials Module이 필요합니다.

Metal Processing 모듈			
지배식	**태그**	**차원**	**솔버**
Austenite Decomposition	audc	3D, 2D, 2D axisymmetric	time dependent
Carburization	carb	3D, 2D, 2D axisymmetric, 1D, 1D axisymmetric	time dependent
Metal Phase Transformation[1]	metp	3D, 2D, 2D axisymmetric	time dependent
Heat Transfer with Phase Transformations[1]	ht + metp	3D, 2D, 2D axisymmetric	time dependent
Steel Quenching[1]	ht + solid + audc	3D, 2D, 2D axisymmetric	time dependent
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Microfluidics 모듈			
지배식	태그	차원	솔버
Chemical Species Transport			
Transport of Diluted Species[1]	tds	all dimensions	stationary time dependent
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Reacting Flow			
Laminar Flow, Diluted Species[1]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Creeping Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow[1]	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Multiphase Flow			
Two-Phase Flow, Moving Mesh			
Laminar Two-Phase Flow, Moving Mesh	—	3D, 2D, 2D axisymmetric	time dependent
Two-Phase Flow, Level Set			
Laminar Two-Phase Flow, Level Set	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Phase Field			
Laminar Two-Phase Flow, Phase Field	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Three-Phase Flow, Phase Field			
Laminar, Three-Phase Flow, Phase Field	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization

Microfluidics 모듈			
지배식	**태그**	**차원**	**솔버**
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid-Structure Interaction			
Fluid–Solid Interaction, Fixed Geometry[2]	—	3D, 2D, 2D axisymmetric	stationary stationary, one way time dependent time dependent, one way
Fluid-Solid Interaction, Two-Phase Flow, Phase Field, Fixed Geometry[2]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Rarefied Flow			
Slip Flow	slpf	3D, 2D, 2D axisymmetric	stationary time dependent
Mathematics			
Moving Interface			
Level Set	ls	all dimensions	time dependent with phase initialization
Level Set in Porous Media	ls	all dimensions	time dependent with phase initialization
Phase Field in Fluids	pf	all dimensions	time dependent time dependent with phase initialization
Ternary Phase Field	terpf	3D, 2D, 2D axisymmetric	time dependent

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Mixer 모듈			
지배식	**태그**	**차원**	**솔버**
Chemical Species Transport			
Rotating Machinery, Reacting Flow			
Laminar Flow	—	3D, 2D,	frozen rotor time dependent
Turbulent Flow			
Turbulent Flow, k-ε	—	3D, 2D	frozen rotor time dependent
Turbulent Flow, k-ω	—	3D, 2D	frozen rotor time dependent
Turbulent Flow, SST	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Fluid Flow			
Single-Phase Flow			
Rotating Machinery, Fluid Flow			
Rotating Machinery, Laminar Flow	spf	3D, 2D	frozen rotor time dependent
Rotating Machinery, Turbulent Flow, Algebraic yPlus	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Turbulent Flow, L-VEL	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Turbulent Flow, k-ε	spf	3D, 2D	frozen rotor time dependent
Rotating Machinery, Turbulent Flow, Realizable k-ε	spf	3D, 2D	frozen rotor time dependent

Mixer 모듈			
지배식	**태그**	**차원**	**솔버**
Rotating Machinery, Turbulent Flow, k-ω	spf	3D, 2D	frozen rotor time dependent
Rotating Machinery, Turbulent Flow, SST	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Turbulent Flow, Low Re k-ε	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Turbulent Flow, Spalart-Allmaras	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Turbulent Flow, v2-f	spf	3D, 2D	frozen rotor with initialization time dependent with initialization
Potential Flow			
Incompressible Potential Flow	lpf	3D, 2D, 2D axisymmetric	stationary
Compressible Potential Flow	cpf	all dimensions	stationary time dependent
Rotating Machinery, Mixture Model			
Mixture Model, Laminar Flow	—	3D, 2D	frozen rotor time dependent
Mixture Model, Algebraic yPlus	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Mixture Model, L-VEL	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Mixture Model, k-ε	—	3D, 2D	frozen rotor, time dependent
Mixture Model, Realizable k-ε	—	3D, 2D	frozen rotor, time dependent
Mixture Model, k-ω	—	3D, 2D	frozen rotor, time dependent

Mixer 모듈			
지배식	**태그**	**차원**	**솔버**
Mixture Model, SST	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Mixture Model, Low Re k-ε	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Mixture Model, Spalart-Allmaras	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Mixture Model, v2-f	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Phase Transport Mixture Model			
Laminar Flow	—	3D, 2D	frozen rotor, time dependent
Turbulent Flow, Algebraic yPlus	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, L-VEL	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, k-ε	—	3D, 2D	frozen rotor, time dependent
Turbulent Flow, Realizable k-ε	—	3D, 2D	frozen rotor, time dependent
Turbulent Flow, k-ω	—	3D, 2D	frozen rotor, time dependent
Turbulent Flow, SST	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, Spalart-Allmaras	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, v2-f	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, Two-Phase Flow, Level Set			

Mixer 모듈			
지배식	**태그**	**차원**	**솔버**
Laminar Two-Phase Flow, Level Set	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Level Set, Algebraic yPlus	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Level Set, L-VEL	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Level Set, k-ε	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Level Set, Realizable k-ε	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Level Set, k-ω	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Level Set, SST	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Level Set, Low Re k-ε	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Level Set, Spalart-Allmaras	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Level Set, v2-f	—	3D, 2D	time dependent with initialization
Rotating Machinery, Two-Phase Flow, Phase Field			
Laminar Two-Phase Flow, Phase Field	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Phase Field, Algebraic yPlus	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Phase Field, L-VEL	—	3D, 2D	time dependent with initialization

Mixer 모듈			
지배식	**태그**	**차원**	**솔버**
Two-Phase Flow, Phase Field, k-ε	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Phase Field, Realizable k-ε	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Phase Field, k-ω	—	3D, 2D	time dependent with phase initialization
Two-Phase Flow, Phase Field, SST	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Phase Field, Low Re k-ε	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Phase Field, Spalart-Allmaras	—	3D, 2D	time dependent with initialization
Two-Phase Flow, Phase Field, v2-f	—	3D, 2D	time dependent with initialization
Rotating Machinery, Nonisothermal Flow			
Laminar Flow	—	3D, 2D	frozen rotor time dependent
Turbulent Flow, Algebraic yPlus	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, L-VEL	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, k-ε	—	3D, 2D	frozen rotor time dependent
Turbulent Flow, Realizable k-ε	—	3D, 2D	frozen rotor time dependent

Mixer 모듈			
지배식	**태그**	**차원**	**솔버**
Turbulent Flow, k-ω	—	3D, 2D	frozen rotor time dependent
Turbulent Flow, SST	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, Low Re k-ε	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, Spalart-Allmaras	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Turbulent Flow, v2-f	—	3D, 2D	frozen rotor with initialization time dependent with initialization
Rotating Machinery, High Mach Number Flow			
High Mach Number Flow, Laminar	—	3D, 2D	frozen rotor time dependent
High Mach Number Flow, k-ε	—	3D, 2D	frozen rotor time dependent
High Mach Number Flow, Spalart-Allmaras	—	3D, 2D	frozen rotor with initialization time dependent with initialization

Molecular Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Fluid Flow			
Rarefied Flow			
Free Molecular Flow	fmf	3D, 2D, 2D axisymmetric	stationary time dependent
Transitional Flow	tran	3D, 2D	stationary time dependent

Multibody Dynamics 모듈			
지배식	**태그**	**차원**	**솔버**
Fluid Flow			
Rarefied Flow			
Fluid-Multibody Interaction[1]	—	3D, 2D	stationary time dependent time dependent, modal eigenfrequency eigenfrequency, prestressed frequency domain frequency domain, prestressed frequency domain, modal frequency domain, prestressed, modal random vibration(PSD) response spectrum
Fluid-Multibody Interaction, Assembly[1]	—	3D, 2D	stationary stationary, one-way FSI time dependent time dependent, one-way FSI time dependent, modal eigenfrequency eigenfrequency, prestressed frequency domain frequency domain, prestressed frequency domain, modal frequency domain, prestressed, modal random vibration(PSD) response spectrum
Lumped Mechanical System	—	all dimensions	stationary time dependent eigenfrequency frequency domain

Multibody Dynamics 모듈			
지배식	**태그**	**차원**	**솔버**
Acoustic-Structure Boundary[1]	—	3D, 2D, 2D axisymmetric	boundary mode analysis bolt pretension eigenfrequency eigenfrequency, prestressed frequency domain frequency domain, modal frequency domain, modal, AWE reduced order model frequency domain, modal, reduced-order model frequency domain, mode analysis frequency domain, prestressed liner buckling random vibration (PSD) response spectrum shape optimization, frequency domain shape optimization, stationary time dependent time dependent, modal time dependent, modal, reduced-order model time dependent, prestressed, modal topology optimization, frequency domain topology optimization, stationary

Multibody Dynamics 모듈			
지배식	**태그**	**지배식**	**지배식**
Thermoviscous-Acoustic-Structure Boundary[1]	—	3D, 2D, 2D axisymmetric	eigenfrequency eigenfrequency, prestressed frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal random vibration response spectrum stationary time dependent time dependent, modal

[1] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

Particle Tracing 모듈			
지배식	**태그**	**차원**	**솔버**
AC/DC			
Particle Tracing			
Particle Field Interaction, Nonrelativistic	—	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Particle Field Interaction, Relativistic[1]	—	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Charged Particle Tracing	cpt	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Fluid Flow			
Particle Tracing			
Particle Tracing for Fluid Flow	fpt	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Fluid-Particle Interaction	—	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Droplet Sprays in Fluid Flow	—	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
Mathematics			
Mathematical Particle Tracing	pt	3D, 2D, 2D axisymmetric	bidirectionally coupled particle tracing time dependent
[1] AC/DC Module이 필요합니다.			

Pipe Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Acoustics			
Pipe Acoustics			
Pipe Acoustics, Frequency Domain	pafd	3D, 2D	eigenfrequency frequency domain
Pipe Acoustics, Transient	patd	3D, 2D	time dependent
Chemical Species Transport			
Transport of Diluted Species in Pipes	dsp	3D, 2D	stationary time dependent
Reacting Pipe Flow	rpfl	3D, 2D	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Pipe Flow	pfl	3D, 2D	stationary time dependent
Water Hammer	whtd	3D, 2D	time dependent
Nonisothermal Flow			
Nonisothermal Pipe Flow	nipfl	3D, 2D	stationary time dependent
Fluid–Pipe Interaction, Fixed Geometry[2]	—	3D, 2D	stationary time dependent
Heat Transfer			
Heat Transfer in Pipes	htp	3D, 2D	stationary time dependent
Structural Mechanics			

Pipe Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Pipe Mechanics	pipem	3D, 2D	stationary eigenfrequency time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, modal reduced-order model time dependent response spectrum random vibration(PSD)

Plasma 모듈			
지배식	**태그**	**차원**	**솔버**
AC/DC			
Electrical Circuit	cir	Not space dependent	stationary frequency domain time dependent small signal analysis, frequency domain eigenfrequency
Electrostatics[1]	es	all dimensions	stationary time dependent stationary source sweep
Fluid Flow			
Single-Phase Flow			
Laminar Flow[1]	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Plasma			
Boltzmann Equation, Two-Term Approximation	be	0D	mean energies reduced electric fields time dependent
Plasma, Time Periodic	ptp	1D, 2D axisymmetric	time periodic time periodic to time dependent
Plasma	plas	all dimensions	time dependent stationary
Inductively Coupled Plasma[2,4]	—	3D, 2D, 2D axisymmetric	frequency-transient frequency-stationary
Inductively Coupled Plasma with RF Bias[2,4]	—	2D, 2D axisymmetric	frequency-time periodic time periodic to time dependent
Microwave Plasma[3,4]	—	3D, 2D, 2D axisymmetric	frequency-transient
Electric Discharges			

Plasma 모듈			
지배식	**태그**	**차원**	**솔버**
Corona Discharge[4]	—	all dimensions	stationary
Electrical Breakdown Detection	ebd	3D, 2D, 2D axisymmetric	time dependent
Equilibrium Discharges			
Equilibrium Discharges, Out-of-Plane Currents[2,4]	—	2D, 2D axisymmetric	stationary time dependent frequency-transient frequency-stationary
Equilibrium Discharges, In-Plane Currents[2,4]	—	2D, 2D axisymmetric	stationary time dependent frequency-transient frequency-stationary
Equilibrium Discharges[2,4]	—	3D	stationary time dependent frequency-transient frequency-stationary
Species Transport			
Drift Diffusion	dd	all dimensions	time dependent
Heavy Species Transport	hs	all dimensions	time dependent
Charge Transport	ct	all dimensions	stationary

[1] 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함되어 있습니다.

[2] AC/DC Module이 필요합니다.

[3] RF Module이 필요합니다.

[4] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

Polymer Flow 모듈			
지배식	태그	차원	솔버
Chemical Species Transport			
Transport of Diluted Species[1]	tds	all dimensions	stationary time dependent
Reacting Flow			
Laminar Flow, Diluted Species[1]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Creeping Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Viscoelastic Flow	vef	3D, 2D, 2D axisymmetric	stationary time dependent
Rotating Machinery, Fluid Flow			
Rotating Machinery, Laminar Flow	spf	3D, 2D	frozen rotor time dependent
Potential Flow			
Incompressible Potential Flow	ipf	3D, 2D, 2D **axisymmetric**	stationary
Multiphase Flow			
Two-Phase Flow, Moving Mesh			
Laminar Two-Phase Flow, Moving Mesh	—	3D, 2D, 2D axisymmetric	time dependent
Two-Phase Flow, Level Set			

Polymer Flow 모듈			
지배식	태그	차원	솔버
Laminar Two-Phase Flow, Level Set	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Two-Phase Flow, Level Set, Brinkman Equations	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Two-Phase Flow, Phase Field			
Laminar Two-Phase Flow, Phase Field	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Three-Phase Flow, Phase Field			
Laminar, Three-Phase Flow, Phase Field	—	3D, 2D, 2D axisymmetric	time dependent with phase initialization
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			
Laminar Flow[(2)]	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Viscoelastic Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF

Polymer Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Fluid-Structure Interaction			
Fluid-Solid Interaction, Fixed Geometry[2]	—	3D, 2D, 2D axisymmetric	stationary stationary, one way time dependent time dependent, one way
Fluid-Solid Interaction, Viscoelastic Flow, Fixed Geometry[2]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Fluid-Solid Interaction, Two-Phase Flow, Phase Field, Fixed Geometry[2]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Heat Transfer			
Heat Transfer in Fluids[1]	ht	all dimensions	stationary time dependent
Heat Transfer in Solids and Fluids[1]	ht	all dimensions	stationary time dependent
Curing			
Curing Reaction	creq	3D, 2D, 2D axisymmetric, 1D	stationary time dependent
Moving Interface			
Level Set	ls	all dimensions	time dependent with phase initialization
Level Set in Porous Media	ls	all dimensions	time dependent with phase initialization
Phase Field in Fluids	pf	all dimensions	time dependent

Polymer Flow 모듈			
지배식	**태그**	**차원**	**솔버**
			time dependent with phase initialization
Ternary Phase Field	terpf	3D, 2D, 2D axisymmetric	time dependent

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[2] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

Porous Media Flow 모듈			
지배식	태그	차원	솔버
Chemical Species Transport			
Transport of Diluted Species[1]	tds	all dimensions	stationary time dependent
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Transport of Diluted Species in Fractures	dsf	3D, 2D, 2D axisymmetric	stationary time dependent
Moisture Transport			
Moisture Transport in Air	mt	all dimensions	stationary time dependent
Moisture Transport in Porous Media	mt	all dimensions	stationary time dependent
Moisture Transport in Building Materials	mt	all dimensions	stationary time dependent
Moisture Transport in Solids	mts	all dimensions	stationary time dependent
Moisture Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way Moisture Flow time dependent, one-way Moisture Flow
Porous Media Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way Moisture Flow time dependent, one-way Moisture Flow
Reacting Flow			
Laminar Flow, Diluted Species[1]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow in Porous Media			

Porous Media Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Transport of Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Creeping Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Multiphase Flow			
Two-Phase Flow, Level Set			
Two-Phase Flow, Level Set, Brinkman Equations	—	3D, 2D, 2D axisymmetric	time dependent with initialization
Phase Transport			
Phase Transport	phtr	all dimensions	stationary time dependent
Phase Transport in Porous Media	phtr	all dimensions	stationary time dependent
Phase Transport in Free and Porous Media Flow	phtr	all dimensions	stationary time dependent
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Layered Darcy's Law	ldl	3D	stationary time dependent
Fracture Flow	esff	3D, 2D, 2D axisymmetric	stationary time dependent

Porous Media Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Richards' Equation	dl	all dimensions	stationary time dependent
Multiphase Flow in Porous Media	—	all dimensions	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF
Heat Transfer			
Heat Transfer in Solids	ht	all dimensions	stationary time dependent
Heat Transfer in Fluids[1]	ht	all dimensions	stationary time dependent
Heat Transfer in Solids and Fluids[1]	ht	all dimensions	stationary time dependent
Thin Structures			
Heat Transfer in Fractures	htlsh	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain
Heat and Moisture Transport			

Porous Media Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Moist Air	—	all dimensions	stationary time dependent thermal perturbation, frequency domain
Moist Porous Media	—	all dimensions	stationary time dependent thermal perturbation, frequency domain
Building Materials	—	all dimensions	stationary time dependent thermal perturbation, frequency domain
Heat and Moisture Flow			
Laminar Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way Moisture Flow time dependent, one-way Moisture Flow
Porous Media Flow	—	3D, 2D, 2D axisymmetric	stationary time dependent stationary, one-way Moisture Flow time dependent, one-way Moisture Flow
Porous Media			
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent
Local Thermal Nonequilibrium	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain
Heat Transfer in Packed Beds	ht	all dimensions	stationary time dependent thermal perturbation, frequency domain
Structural Mechanics			
Poroelasticity			

Porous Media Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Poroelasticity, Solid[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Poroelasticity, Large Deformation, Solid[2,3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Poroelasticity, Layered Shell[2,4]	—	3D	stationary time dependent
Unsaturated Poroelasticity[2,3]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Mathematics			
Level Set	ls	all dimensions	time dependent with phase initialization
Level Set in Porous Media	ls	all dimensions	time dependent with phase initialization

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[2] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

[3] Structural Mechanics Module이 필요합니다.

[4] Composite Materials Module 및 Structural Mechanics Module이 필요합니다

Ray Optics 모듈			
지배식	**태그**	**차원**	**솔버**
Optics			
Ray Optics			
Geometrical Optics	gop	3D, 2D, 2D axisymmetric	ray tracing bidirectionally coupled ray tracing time dependent
Ray Heating	—	3D, 2D, 2D axisymmetric	ray tracing bidirectionally coupled ray tracing time dependent

RF 모듈			
지배식	**태그**	**차원**	**솔버**
AC/DC			
Electrical Circuit	cir	Not space dependent	stationary frequency domain time dependent small signal analysis, frequency domain eigenfrequency
Heat Transfer			
Electromagnetic Heating			
Microwave Heating[1]	—	3D, 2D, 2D axisymmetric	frequency-stationary frequency-transient frequency-stationary, one-way electromagnetic heating frequency-transient, one-way electromagnetic heating
Radio Frequency			
Electromagnetic Waves, Asymptotic Scattering	ewas	3D, 2D	frequency domain
Electromagnetic Waves, Boundary Elements	embe	3D, 2D	frequency domain
Electromagnetic Waves, Frequency Domain	emw	3D, 2D, 2D axisymmetric	adaptive frequency sweep boundary mode analysis eigenfrequency frequency domain frequency domain, modal frequency domain, RF adaptive mesh frequency domain source sweep mode analysis (2D and 2D axisymmetric models only) TEM boundary mode analysis

RF 모듈			
지배식	**태그**	**차원**	**솔버**
Electromagnetic Waves, Time Explicit	ewte	3D, 2D, 2D axisymmetric	time dependent time dependent with FFT
Electromagnetic Waves, Transient	temw	3D, 2D, 2D axisymmetric	eigenfrequency time dependent time dependent, modal time dependent with FFT
Transmission Line	tl	3D, 2D, 1D	eigenfrequency frequency domain
Electromagnetic Waves, FEM-BEM		3D, 2D	frequency domain
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Semiconductor 모듈			
지배식	**태그**	**차원**	**솔버**
AC/DC			
Electrical Circuit	cir	Not space dependent	stationary frequency domain time dependent small signal analysis, frequency domain eigenfrequency
Electrostatics[1]	es	all dimensions	stationary time dependent stationary source sweep eigenfrequency frequency domain small signal analysis, frequency domain
Semiconductor			
Semiconductor	semi	all dimensions	small-signal analysis, frequency domain stationary time dependent semiconductor equilibrium
Semiconductor Optoelectronics, Beam Envelopes[2]	—	3D, 2D, 2D axisymmetric	frequency-stationary frequency-transient small-signal analysis, frequency domain
Semiconductor Optoelectronics, Frequency Domain[2]	—	3D, 2D, 2D axisymmetric	frequency-stationary frequency-transient small-signal analysis, frequency domain
Schrödinger Equation	schr	all dimensions	eigenvalue stationary time dependent
Schrödinger-Poisson Equation	—	all dimensions	Schrödinger-Poisson

Semiconductor 모듈			
지배식	**태그**	**차원**	**솔버**
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Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Acoustics			
Elastic Waves			
Elastic Waves, Time Explicit	elte	3D, 2D, 2D axisymmetric	time dependent
Piezoelectric Waves, Time Explicit		3D, 2D, 2D axisymmetric	time dependent
Chemical Species Transport			
Transport in Solids	ts	all dimensions	stationary time dependent
Fluid Flow			
Fluid-Structure Interaction			
Fluid-Solid Interaction[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid-Shell Interaction[2]	—	3D, 2D axisymmetric	stationary time dependent
Fluid-Shell Interaction, Fixed Geometry	—	3D, 2D axisymmetric	stationary stationary, one way time dependent time dependent, one way
Fluid-Membrane Interaction[2]	—	3D, 2D axisymmetric	stationary time dependent
Fluid-Membrane Interaction, Fixed Geometry[2]	—	3D, 2D axisymmetric	stationary stationary, one way time dependent time dependent, one way
Fluid-Pipe Interaction, Fixed Geometry[2,7]	—	3D, 2D	stationary time dependent

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Conjugate Heat Transfer, Fluid-Solid Interaction[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid–Solid Interaction, Viscoelastic Flow[2,10]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Fluid-Solid Interaction, Two-Phase Flow, Phase Field[2,6]	—	3D, 2D, 2D axisymmetric	time dependent time dependent with phase initialization
Solid–Thin-Film Damping[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, modal reduced-order model response spectrum random vibration (PSD)
Shell–Thin-Film Damping[2]	—	3D, 2D axisymmetric	stationary eigenfrequency time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, modal reduced-order model response spectrum random vibration (PSD)

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Structural Mechanics			
Solid Mechanics[1]	solid	3D, 2D, 2D axisymmetric 1D, 1D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed mode analysis time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model frequency domain, AWE reduced-order model response spectrum random vibration (PSD) linear buckling bolt pretension

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Shell	shell	3D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model response spectrum random vibration (PSD) linear buckling
Plate	plate	2D	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model response spectrum random vibration (PSD) linear buckling

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Beam	beam	3D, 2D	stationary eigenfrequency time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, modal reduced-order model time dependent response spectrum random vibration(PSD) linear buckling
Beam Cross Section	bcs	3D, 2D	stationary
Truss	truss	3D, 2D	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model response spectrum randomvibration (PSD) linear buckling

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Wire	wire	3D, 2D	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model response spectrum random vibration (PSD) linear buckling
Membrane	mbrn	3D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal frequency domain, modal reduced-order model response spectrum randomvibration (PSD)

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Pipe Mechanics	pipem	3D, 2D	stationary eigenfrequency time dependent, modal time dependent, modal reduced-order model frequency domain frequency domain, modal frequency domain, modal reduced-order model time dependent response spectrum random vibration (PSD)
Phase Field Damage[2,11]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Thermal–Structure Interaction			
Thermal Stress, Solid[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Thermal Stress, Shell[2,4]	—	3D, 2D axisymmetric	stationary time dependent
Thermal Stress, Membrane[2,4]	—	3D, 2D axisymmetric	stationary time dependent

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Joule Heating and Thermal Expansion[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Piezoelectricity			
Piezoelectricity, Solid[2]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency eigenfrequency, prestressed time dependent time dependent, modal frequency domain frequency domain, modal frequency domain, prestressed frequency domain, prestressed, modal small-signal analysis, frequency domain linear buckling
Piezoelectricity, Layered Shell[2,5]	—	3D	stationary eigenfrequency time dependent frequency domain
Magnetomechanics			
Piezomagnetism[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Nonlinear Magnetostriction[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
			frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetomechanics[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetomechanics, No Currents[2,3]	—	3D, 2D, 2D axisymmetric	stationary eigenfrequency time dependent frequency domain small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Magnetic–Elastic Interaction in Rotating Machinery[2,3]	—	3D, 2D	stationary time dependent frequency domain
Electrostriction			
Ferroelectroelasticity[2,9]	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain
Electrostriction[2,9]	—	3D, 2D, 2D axisymmetric	stationary time dependent frequency domain
Piezoresistivity			

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
Piezoresistivity, Shell[2,12]	—	3D	stationary time dependent time dependent, modal frequency domain frequency domain, modal small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Piezoresistivity, Layered Shell[2,5,12]	—	3D	stationary time dependent time dependent, modal frequency domain frequency domain, modal small-signal analysis, frequency domain eigenfrequency, prestressed frequency domain, prestressed
Poroelasticity			
Poroelasticity, Large Deformation, Solid[2,8]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Unsaturated Poroelasticity[2,8]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Mathematics			
Moving Interface			
Phase Field in Solids	pfs	3D, 2D, 2D axisymmetric	stationary time dependent

Structural Mechanics 모듈			
지배식	**태그**	**차원**	**솔버**
1 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함되어 있습니다. 2 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다. 3 AC/DC Module이 필요합니다. 4 Heat Transfer Module이 필요합니다. 5 Composite Materials Module이 필요합니다. 6 CFD Module, Polymer Flow, 또는 Microfluidics Module이 필요합니다. 7 Pipe Flow Module이 필요합니다. 8 Porous Media Flow Module이 필요합니다. 9 AC/DC Module 또는 MEMS Module이 필요합니다. 10 Polymer Flow Module이 필요합니다. 11 Nonlinear Structural Materials Module 혹은 Geomechanics Module이 필요합니다. 12 MEMS Module이 필요합니다.			

Subsurface Flow 모듈			
지배식	태그	차원	솔버
Chemical Species Transport			
Transport of Diluted Species[1]	tds	all dimensions	stationary time dependent
Transport of Diluted Species in Porous Media	tds	all dimensions	stationary time dependent
Transport of Diluted Species in Fractures	dsf	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow			
Laminar Flow, Diluted Species[1]	—	3D, 2D, 2D axisymmetric	stationary time dependent
Reacting Flow in Porous Media			
Transport of Diluted Species	—	3D, 2D, 2D axisymmetric	stationary time dependent
Fluid Flow			
Single-Phase Flow			
Creeping Flow	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Laminar Flow[1]	spf	3D, 2D, 2D axisymmetric	stationary time dependent
Multiphase Flow			
Phase Transport			
Phase Transport	phtr	all dimensions	stationary time dependent
Phase Transport in Porous Media	phtr	all dimensions	stationary time dependent

Subsurface Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Phase Transport in Free and Porous Media Flow	phtr	all dimensions	stationary time dependent
Porous Media and Subsurface Flow			
Brinkman Equations	br	3D, 2D, 2D axisymmetric	stationary time dependent
Darcy's Law	dl	all dimensions	stationary time dependent
Fracture Flow	ff	3D, 2D, 2D axisymmetric	stationary time dependent
Richards' Equation	dl	all dimensions	stationary time dependent
Multiphase Flow in Porous Media	—	all dimensions	stationary time dependent
Two-Phase Darcy's Law	tpdl	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Brinkman	fp	3D, 2D, 2D axisymmetric	stationary time dependent
Free and Porous Media Flow, Darcy	—	3D, 2D, 2D axisymmetric	stationary time dependent
Nonisothermal Flow			
Brinkman Equations	—	3D, 2D, 2D axissymmetric	stationary time dependent stationary, one-way NITF time dependent, one-way NITF

Subsurface Flow 모듈			
지배식	**태그**	**차원**	**솔버**
Shallow Water Equations			
Shallow Water Equations, Time Explicit	swe	1D and 2D	time dependent
Heat Transfer			
Heat Transfer in Solids	ht	all dimensions	stationary time dependent
Heat Transfer in Fluids[1]	ht	all dimensions	stationary time dependent
Heat Transfer in Solids and Fluids[1]	ht	all dimensions	stationary time dependent
Heat Transfer in Fractures	htlsh	3D, 2D, 2D axisymmetric	stationary time dependent thermal perturbation, frequency domain
Heat Transfer in Porous Media	ht	all dimensions	stationary time dependent
Structural Mechanics			
Poroelasticity			
Poroelasticity, Solid[2]	—	3D, 2D, 2D axisymmetric	stationary time dependent

[1] 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함이 되어 있습니다.

[2] 이 지배식들은 미리 정의된 Multiphysics 노드입니다. 해당 노드를 추가하면 각 분야의 필요한 지배식들이 자동적으로 적용됩니다.

Wave Optics 모듈			
지배식	태그	차원	솔버
Heat Transfer			
Electromagnetic Heating			
Laser Heating[1]	—	3D, 2D, 2D axisymmetric	frequency-stationary frequency-transient frequency-stationary, one-way electromagnetic heating frequency-transient, one-way electromagnetic heating
Optics			
Wave Optics			
Electromagnetic Waves, Beam Envelopes	ewbe	3D, 2D, 2D axisymmetric	adaptive frequency sweep boundary mode analysis eigenfrequency frequency domain frequency domain, modal wavelength domain frequency domain source sweep
Electromagnetic Waves, Boundary Elements	ebem	3D, 2D	frequency domain wavelength domain
Electromagnetic Waves, Frequency Domain	ewfd	3D, 2D, 2D axisymmetric	adaptive frequency sweep boundary mode analysis eigenfrequency frequency domain frequency domain, modal mode analysis (2D and 2D axisymmetric models only) wavelength domain frequency domain source sweep
Electromagnetic Waves, Time Explicit	teew	3D, 2D, 2D axisymmetric	time dependent time dependent with FFT

Wave Optics 모듈			
지배식	**태그**	**차원**	**솔버**
Electromagnetic Waves, Transient	ewt	3D, 2D, 2D axisymmetric	eigenfrequency time dependent time dependent, modal, time dependent with FFT
Electromagnetic Waves, FEM-BEM[1]		3D, 2D	frequency domain wavelength domain
[1] 이 지배식들은 COMSOL Multiphysics 플랫폼에 포함되어 있습니다. 다만 해당 모듈안에 추가적인 기능들이 포함이 되어 있습니다.			